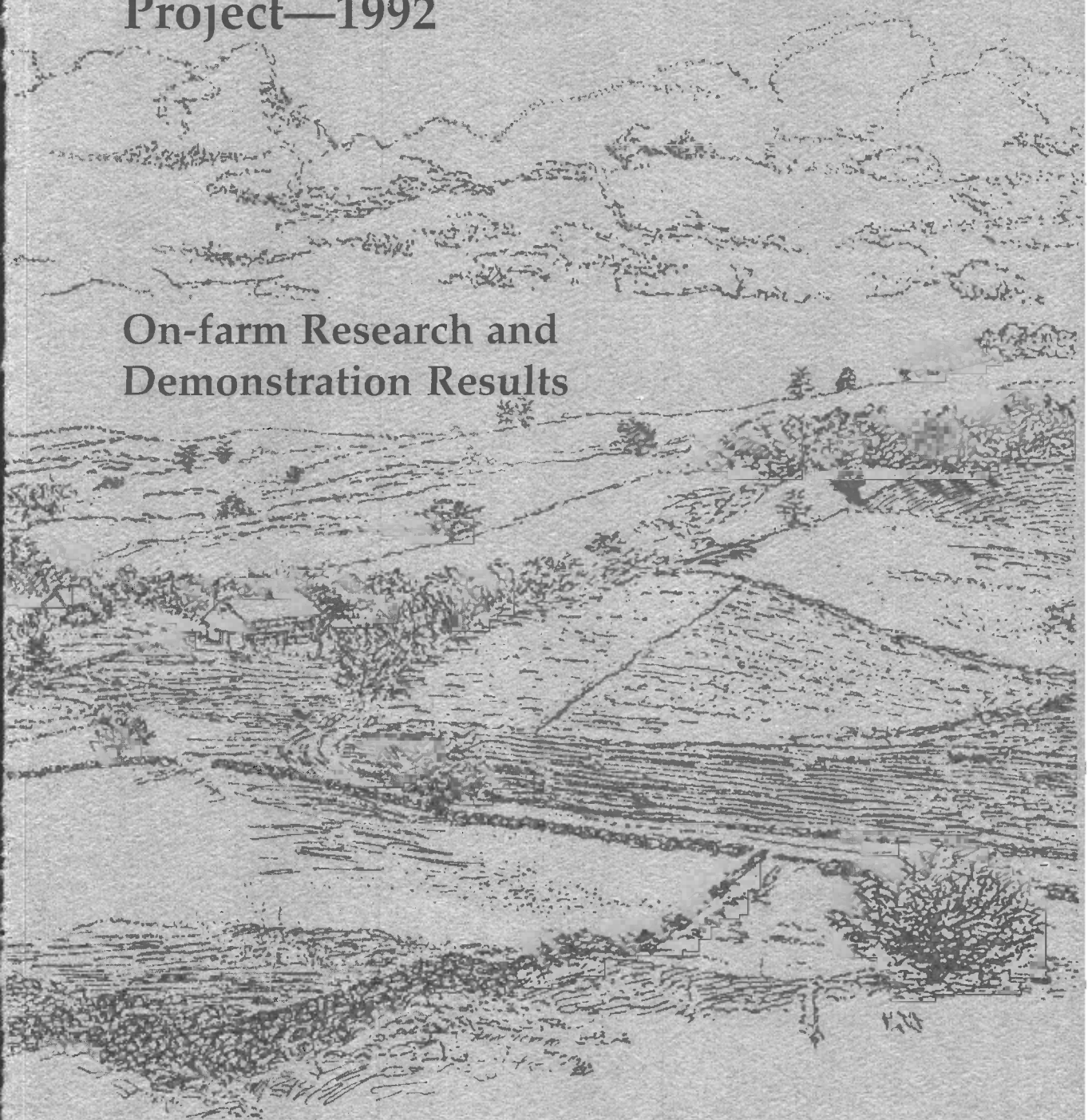
Pennsylvania Sustainable Agriculture Project—1992



On-farm Research and Demonstration Results

A cooperative project of American Farmland Trust
and the Pennsylvania Association for Sustainable Agriculture

Funding for this project has been provided by the Philip Morris Companies, Inc.

Special thanks for technical assistance to Dr. Gerald Jung, USDA Pasture Lab at Penn State University; Suzy Funka-Petry, District Conservationist, USDA Soil Conservation Service, Greene County; Ruth Tonachel, Towanda, Pa.; and Ellen Dietrich, District Conservationist, USDA Soil Conservation Service, Clinton County.

Additional copies are $5. To order, or for more information, contact:

American Farmland Trust
Center for Agriculture in the Environment
P.O. Box 987
DeKalb, IL 60115
815/753-9347 (phone)
815/753-2305 (FAX)

or

American Farmland Trust
National Office
1920 N Street, NW, Suite 400
Washington, D.C. 20036
202/659-5170 (phone)
202/659-8339 (FAX)

Printed on recycled paper with soy ink.

Cover and report designed and produced by Carin Mizera.

Pennsylvania Sustainable Agriculture Project—1992

On-farm Research and Demonstration Results

American Farmland Trust
and the Pennsylvania Association for
Sustainable Agriculture

TABLE OF CONTENTS

INTRODUCTION

Environmental issues are a major concern for U.S. agricultural producers. All across the country, farmers are taking inventory of their operations in an effort to identify and correct farming practices that have the potential to degrade land and water resources. The desire to farm more responsibly has caused a revolution of sorts in many agricultural communities, with farmers adopting environmentally friendly techniques at an unprecedented rate. This trend toward a renewed environmental responsibility is commonly referred to as sustainable agriculture.

Sustainable agriculture is a term best defined by its component practices. These can be any farming techniques that are practical, profitable and environmentally sound. When used together, sustainable practices form a sustainable farming system, one that is highly integrated, biologically diverse and, above all, flexible.

Farmers who embrace the concept of sustainability believe in stewardship and long-term care of the land. They understand that there is a fine line between using the land and abusing it. They are also keenly aware that how they manage the farm today will have a lasting impact on the quality of life for future generations.

During the 1992 growing season, American Farmland Trust and the Pennsylvania Association for Sustainable Agriculture began a cooperative effort to help farmers experiment with and adopt some of the component practices of sustainable agriculture. The Pennsylvania Sustainable Agriculture Project established 10 on-farm research/demonstration sites at locations throughout the Chesapeake Bay Watershed (and at other locations in the state) with cooperating producers. These on-farm plots were designed to address farm management problems with an emphasis on reducing impacts to water quality, preventing soil erosion, improving farm profitability and protecting the rural environment.

The information presented in this publication was collected from cooperating producers throughout the year. Its purpose is to give the reader an idea of what sustainable agriculture means when component practices are applied to actual farming operations. Also, it may help producers better understand how the concept can work on many different types of farms.

One final note. Any new practice or farming technique should be applied incrementally. In other words, if something in this publication appears applicable to your farm, don't convert your whole operation overnight. Try it first on a small scale (a couple of acres or less) before proceeding further. Remember, most of the material in this publication documents what happened on one farm in one given year. Experiment, evaluate and make decisions that are right for your individual operation.

PARTICIPANTS IN THE PENNSYLVANIA SUSTAINABLE AGRICULTURE PROJECT-1992

Green County
Santino Barchiesi
RD 1, Box 83
Waynesburg, PA 15370

Leigh Shields
RD 1, Box 120
Spraggs, PA 15362

Union County
Preston Boop
RD 2, Box 168
Mifflinburg, PA 17844

Huntington County
Jim Crawford
HCR 71, Box 168B
Hustontown, PA 17229

Clinton County
Charles Dotterer
RD 3, Box 588
Mill Hall, PA 17751

Amos Fisher
RD 3, Box 342
Mill Hall, PA 17751

Lycoming County
Ann & Eric Nordell
RD 1, Box 205
Trout Run, PA 17771

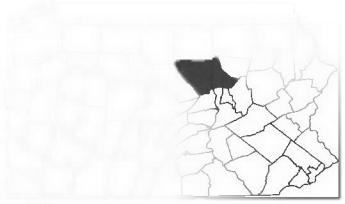
Juniata County
Edgar Ritts
RD 1, Box 87
Honey Grove, PA 17035

Fulton County
Ward Sinclair & Cass Peterson
Flickerville Mountain Farm
Rt#1, Box 765
Warfordsburg, PA 17267

Bradford County
Gary Van Der Weert
RD 2, Box 202
Athens, PA 18810

PROJECT RESULTS

ANNE & ERIC NORDELL LYCOMING COUNTY



COVER CROPS IN A SMALL-SCALE VEGETABLE OPERATION

Eric and Anne Nordell have been farming Beech Grove Farm near Trout Run in Lycoming County for 10 years. They grow a wide variety of certified organic vegetables and herbs. They also have several hogs and a flock of laying hens.

The Nordells own a total of 90 acres, the majority of which is woodland and pasture. Vegetable crops are grown on 12 half-acre strips in rotation with cover crops on a hilltop field (six acres total), and in a one-half acre irrigated garden plot. The hilltop acreage is fenced with three strand electric polywire to keep deer out.

Although raised in urban areas, both Eric and Anne worked on farms for many years before moving to Lycoming County. Eric spent time on both Amish farms and conventional dairy farms and Anne worked seven years for a major commercial herb grower in the Pacific Northwest.

Currently, the Nordells grow a small amount of culinary and medicinal herbs, but they derive their primary income from vegetables. A wood-heated greenhouse, a hoop house and portable "grow frames" are used to start seedlings and transplants. Floating row covers are also used for early lettuce transplants and to speed germination of later crops like corn, squash and carrots. "We resist the use of black plastic because it ends up in the landfill," says Anne. They rely on rotations, cover crops and bare fallow to control weeds. No purchased fertilizers or pesticides are used by the Nordells.

All tillage at Beech Grove Farm is done with horses. Eric says, "The way we farm is an attempt to combine my love of horses with Anne's gift for plants." It is also, he says, the result of "being farmers who became gardeners, instead of vice versa."

The horse drawn equipment, the crop rotations and the use of cover crops are all field crop techniques and practices adapted for a market garden system. The use of horses allow the Nordells to increase tillage more than would be possible with only hand labor, yet they avoid the cash costs associated with running a tractor or rototiller. They purchase feed for the horses, but feed and seed are their only significant input costs.

The Nordells are constantly searching for new ideas and information. They read a number of periodicals including the *Small Farmer's Journal, The New Farm, Biodynamic Magazine,* and *NOFA-NY News.* Eric has contributed articles to several of these publications, as well. They visit a lot of farms, organic and conventional, and Eric says, "I've learned something from every farmer I ever talked with."

Over the years, the Nordells have experimented with a number of cover crops to increase soil fertility, organic matter and to control weeds. They have developed a system that alternates cash crops with cover crops, and a summer fallow period. For example, a half-acre plot that produced potatoes in 1991 was planted to rye in the fall and plowed down in the spring of 1992. In June, the plot was worked every two to three weeks with a harrow and then planted to a mixture of oats and field peas in late August. In the spring of 1993, that plot will be planted to lettuce, peas and spinach.

Clover is used in rotation with rye every third year and a rye/hairy vetch mix alternates with the oat/pea mix. (See chart.) This system combines the allelopathic effects of rye with the nitrogen-fixing

abilities of vetch, peas and clovers. It also avoids the insect problems associated with monocropping, and provides enough tillage and cover to control weeds.

Composted manure is applied at light rates depending on the vegetable crop to be planted. The compost is made from hog and horse manures and straw or hay, mixed and aerated by the "work hogs" in an enclosed pen in the barn.

FIELD DIAGRAM

	9	8	7	6	5	4	3	2	1	12	11	10 A & B
SPRING	rye & vetch	rye & **clover**	lettuce peas spinach	clover	rye & vetch	rye	onions	**oats & alfalfa for full year**	rye & vetch	oats	herbs berries flowers	clover & herbs
	potatoes		clover		celery kale squash		clover		fall coles spinach lettuce		clover & mulch	rye & vetch
FALL	rye	**late oats**		rye & vetch	rye	**peas**				**vetch**		
CROPS	cash crop	fallow	cash crop	fallow	cash crop	fallow	cash crop	fallow	cash crop	fallow	cash crop	fallow
byTYPE	root		leaf		leaf & fruit		root		leaf		leaf & flower	
by PLANT/ HARVEST	late		early		late		early		late		early	
TILLAGE	shallow	deep	shallow	deep	shallow	deep	shallow	deep	shallow	deep	shallow	deep

Bold print indicates 1992 trials.

This year, the Nordells chose to experiment with several cover crops in an attempt to compare establishment, ease of incorporation, speed of decomposition and the effects on cash crop growth. They chose to focus on two main areas: 1.) defining the best cover crops to precede early planted cash crops such as onions and greens, and 2.) how and when to establish a leguminous sod in the rotation.

COVER CROPS TO PRECEDE EARLY PLANTED CASH CROPS

Three cover crops were used in this demonstration: spring field peas, hairy vetch and late oats. Four evaluation criteria were used by the Nordells:

1. The cover must provide dependable winter soil cover.
2. The cover must allow soil to dry out and warm up in the spring.
3. The cover must be easy to incorporate with secondary tillage tools so that residues remain in the surface and decompose quickly without interfering with crop growth or quality.
4. The cover must maintain soil structure throughout the growing season.

Spring Field Peas

Spring field peas were the least drought-hardy cover crop planted at Beech Grove in 1991, but thrived in the cool, wet conditions of 1992. On Aug. 26, 1991, peas were planted (150 pounds per acre) in Field 3. Five tons to the acre of compost was added. On Aug. 12, 1992, peas were planted in Field 4 at a rate of 200 pounds per acre, also with five tons to the acre of compost.

The peas planted in 1991 did not germinate well due to drought conditions. Growth was poor (12 to 18 inches) prior to winterkill and they did not achieve good ground cover. However, Anne and Eric found that onion yields from Field 3 during the 1992 season were twice the average, the tops were deep green and the soil remained loose despite record rains in July.

Peas planted in August 1992 grew more than 36 inches and created an 80 to-100 percent ground cover before being killed by frost on Oct. 20. The trial is being repeated to see if the high onion yields experienced in 1992 were related to the peas or the virtual lack of a prior cover crop.

Hairy Vetch

Research suggested that hairy vetch would be likely to winterkill if planted before Sept. 1. Hairy vetch was planted in Fields 7 & 11 on Aug. 14, 1991 at a rate of 60 pounds per acre. Five tons per acre of compost was applied to Field 7 only.

The Nordells were surprised to find that the vetch germinated and grew well (10 to 12 inches tall) despite dry conditions, and came through the winter alive and dense. They also found it easy to incorporate with a spring tooth harrow or shallow plowing.

However, the vetch was slow to break down during the long, cool spring of 1992 and appeared to attract maggots that caused major problems (total crop failures in some cases) in onions, peas and spinach. Once the soil warmed, later crops appeared to benefit greatly from the nutrients released by the vetch breakdown.

Hairy vetch was planted again, in Field 12, on Aug. 19, 1992 (60 pounds per acre) and had made only three to six inches of topgrowth by Nov. 1, providing less than 30-percent ground cover. However, the roots were better sodded and nodulated than field peas or vetch with rye at this time.

Late Oats

The Nordells wanted to experiment with oats because they are cheaper and more reliable than annual legumes. It was hoped that delaying planting until mid-September would limit excessive top growth before winter.

Oats were planted on Field 8 on Sept. 14, 1992 at a rate of six bushels per acre. At the end of November, there were six to eight inches of top growth and approximately 70 to 75 percent ground cover.

ESTABLISHMENT OF LEGUME SOD IN ROTATION

The Nordells have been searching for a way to establish a legume sod in their rotation, compatible with the needs of the vegetable crops and that fits well with their cover crop/ bare fallow / cover crop sequence. In the past, a 3:1 mix of yellow sweet clover and dutch white clover, broadcast at 16 to 24 pounds per acre, had been used. They found that a full year in legume sod increases soil fertility and tilth better than the bare fallow sequence, but there have been problems with increased weed and insect populations. The Nordells hope to find a dependable legume sod that either thrives in the bare fallow sequence or that can be grown a full year and incorporated ahead of late fall-planted crops the second year.

Direct-Seeded Alfalfa and Oats

Fields 2 and 10A were planted on April 9, 1992 to 16 pounds per acre of alfalfa and two and one-half bushels per acre of oats in an attempt to establish a full year of sod without an increase of flea beetles seen following clovers. The oats were first clipped on June 25, 1992. The mulch of oat clippings was so thick that regrowth was slow and weeds began to appear. Both fields were plowed under on Aug. 17, 1992 in order to stop weeds from setting seed. The Nordells did not feel that the growth cycles of these two plants are compatible with each other or with their "cut-and-come-again" clipping system.

Frost-Seeded Alfalfa and Clovers Before Late Oats

This experiment was on Fields 8 and 10B, prior to planting the oats cover described earlier. Following potato harvest, on Oct. 1, 1991, three bushels per acre of rye was direct-seeded after incorporation of five tons to the acre of compost. On March 15, 1992, a mix of alfalfa, sweet clover and dutch white clover (28 pounds per acre) was frost-seeded over the rye. The rye was mowed three times: May 8, May 29, and June 25, 1992. On July 30, the entire mix was plowed down just before a few smartweed in the stand set seed. The alfalfa/clover mix was 18 to 24 inches at that time.

The Nordells calculated that with alfalfa in the mix, this stand was not any cheaper than fall-seeded spring field peas. They are concerned that in a warmer season, weeds might become a problem earlier. The life cycle of rye coincides well with frost-seeded alfalfa, and alfalfa in the stand did much better with a rye clipping schedule than with the one used for oats. It also did better than alfalfa planted alone. However, this may have been due to the addition of compost, because the alfalfa/clover mix in Field 10B without compost did not have as deep a color and clovers dominated. Overall, the Nordells believe that clovers may be better suited to a low-input cover crop system.

It was noted that rye decomposed much faster than oats after clipping, so a matting of clippings

was not a problem. In addition, frost-seeding legumes into rye is generally not successful when the rye is seeded in August because it smothers the legume. Rye seeded in November does not provide much organic matter or weed control.

Sweet Clover Overseeded with Rye

On Aug. 14, 1992, sweet clover was broadcast on Field 7 at a rate of 17 pounds per acre. Rye was overseeded on Sept. 18 at a rate of two bushels per acre, in hopes that the rye would protect the clover from winter heaving. Despite adequate moisture, the rye stand was poor, providing minimal ground cover by late October. The Nordells have concluded that they would be better off increasing the clover seeding rate and using it alone.

Direct-Seeded Sweet Clover, Alfalfa and Rye in September

Because direct-seeding rye with sweet clover had shown rye to be too competitive, the Nordells tried direct seeding the two crops with alfalfa in September hoping that later planting would keep the rye from choking out the legumes. Field 3 was seeded on plowed ground after onion harvest, on Sept. 14, 1992, with two bushels per acre of rye, 12 pounds per acre of alfalfa and eight pounds per acre of sweet clover.

The Nordells found that rye provided much better ground cover than where it was overseeded, although this year's cool fall meant slower than normal growth rates. They intend to try this experiment again since the rye provides ground cover and plenty of material for spring plowdown even if the alfalfa or clover fail.

Sweet Clover Overseeded into Row Crops

On July 29, 1992, the Nordells overseeded sweet clover into row crops in Field 11 at 18 pounds per acre. It was hoped that earlier establishment would improve winter hardiness and that the clover would help control weeds and erosion in the cash crop as well. The late July planting date was chosen because they had found in earlier trials that June or early July seedings created too much topgrowth and may have been responsible for more blight and rot in the cash crop.

By mid-October, the sweet clover had grown from six to 10 inches, depending on the canopy of the adjacent cash crop. For example, the clover was thicker and taller between carrot rows than in the cabbage or calendula. The Nordells felt this was the most successful of their clover trials although sweet clover overseedings have not done as well in drier years. Their only reservations were that the clover mulch created cover for rodents who damage carrots (nearby carrots without the clover were unharmed) and that the seeding was too late to prevent runoff and compaction from heavy July rains.

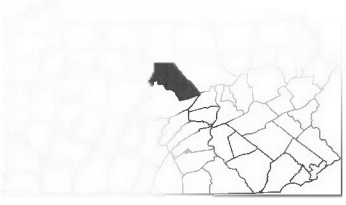
GENERAL SUMMARY OF 1992 RESULTS

The Nordells intend to continue experimenting with a number of the cover crops described, but feel they learned several specific things this year.

- Spring field peas and hairy vetch have very different growth habits and requirements and should be used accordingly.
- Hairy vetch, like rye and clover, attracts maggots in the breakdown stage; dried and shriveled winterkilled plants, like spring field peas, do not.
- Frost-seeding rye with alfalfa and clover can successfully delay the bare fallow before a late seeding of oats.
- Clovers may be better than alfalfa in a low-input system.
- Frost-seeding alfalfa into rye is more dependable than direct-seeding alfalfa with oats under their clipping schedule.
- Overseeding sweet clover into row crops may be the best way to establish this cover crop in a wet year.
- Direct-seeding clover with rye in September may hold promise in a warmer year.

Along with learning specific things about various cover crops, Anne and Eric are excited about trying new mixes and sequences in their rotations. This is the essence of on-farm research, with the farmer taking charge of his own operation and finding ways to improve it.

AMOS FISHER
CLINTON COUNTY



NITROGEN FERTILIZER RATE COMPARISON IN CORN

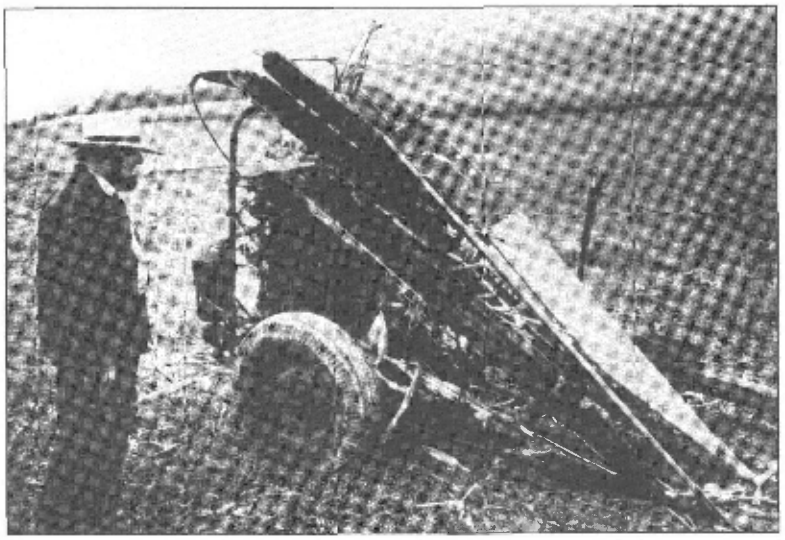
Amos Fisher, his wife and six children operate a 40-cow dairy on 213 acres along the northern slop of the Nittany Valley in Clinton County. They produce 55 acres of corn, 60 acres of hay and use 50 acres for pasture. All field work is done with the 10 mules that are kept on the farm. A tractor is used for belt power to fill the silos and run the liquid manure pump.

Amos is active with the Clinton County Conservation District and believes that conservation is a key element in farming. "My goal is to cut back on chemical fertilizer and pesticides and still maintain good crop production," he says.

PROJECT COMMENTS

"The 105-day corn I planted in this field was originally intended for the silo, but after my long season corn would not dry down, I kept the short season crop for picking.

"Side-dressing nitrogen on this field was a waste of time and money. I would like to work on better manure management in the future to become less dependent on nitrogen fertilizer. I also think that cultivation is a big plus if it can be done without causing erosion."



SITE INFORMATION

- Normal Rotation: 3 corn-4 hay
- Previous Crop: hay
- Yield Goal for 1992: 150 bu./A
- 1991 Yield: 2 ton/A
- Site Size: 2.5 acres
- Soil Types: Murrill sandy loam.
- Soil Test: pH - 6.8 OM% - 1.9 P - 74 #/A K - 256 #/A CEC - 7.0
- Note: Approximately 10 tons of dairy manure was applied to this field in 1991.

MANAGEMENT AND INPUTS

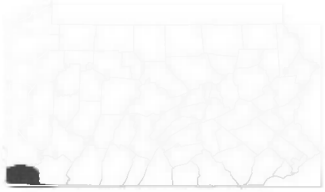
Date	Rate 1	Rate 2	Rate 3	Rate 4
5/3	Plant corn: Pioneer 3540, pop. 26,600, with 130 #/A 13-40-0-5.			
5/8	Apply herbicides: 1 qt./A Bladex, 1.5 pt./A Prowl, and 1 pt./A 2,4-D			
6/17	Cultivate and side-dress 28% N			
	No additional N	30 #/A N	45 #/A N	60 #/A N
11/15	Ear pick corn			
	136.5 bu./A	124.4 bu./A	130.4 bu./A	131.8 bu./A

All yields adjusted to 15.5% moisture

ECONOMIC RESULTS

Input/acre	Rate 1	Rate 2	Rate 3	Rate 4
Seed	$23.47	$23.47	$23.47	$23.47
Pesticide	13.09	13.09	13.09	13.09
Fertilizer	15.86	25.76	30.71	35.66
Machinery & labor	44.90	44.90	44.90	44.90
Total expenses	$97.32	$107.13	$112.17	$117.12
Gross income	$273.00	$248.80	$260.08	$263.60
- Expenses	97.32	107.13	112.17	117.12
Net return	$175.68	$141.67	$147.91	$146.48

SANTINO BARCHIESI
GREENE COUNTY



INTENSIVE ROTATIONAL GRAZING IN A DAIRY OPERATION

Santino "Sandy" Barchiesi Jr. operates a 50-cow dairy farm with the help of his wife Emma. Their 175-acre farm, nestled in the rolling hills of Greene County near Waynesburg, has been in the family since 1955 when Sandy's parents settled here.

Sandy has reduced his corn acreage to approximately 25 acres and has relied on quality forages and the pasture system to feed his milk herd and replacement heifers. He has 44 milk cows and keeps 25 dry cows and heifers.

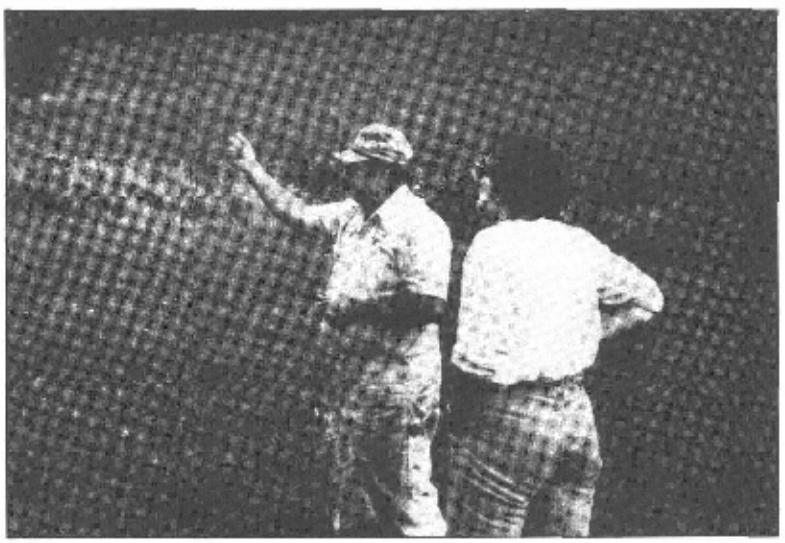
Sandy installed an intensive rotational grazing system in 1987. In 1992, he altered the layout of the paddocks to allow for ease of mowing and future application of soil nutrients. A 50-acre system is sectioned off into 16 paddocks. Additionally, there is a single 16-acre field utilized for grazing after forage harvest.

PROJECT COMMENTS

This project's emphasis was on an economic analysis comparing past years with 1992. "This system has definitely cut my feed costs, there's no doubt about that," Sandy says. "To me that is the bottom line—to maintain my level of milk production and decrease feed costs during the pasture growing season.

"The summer grazing was lower than it should have been, due to lack of rainfall, but I still feel we showed significant savings in feed costs.

"No wild claims here, just facts and figures on how this system has reduced my costs. Calculations are based on savings per animals so that farmers may apply these figures to their herd regardless of the herd composition. Each producer can make their own conclusions to fit their program."



FEED SAVINGS ATTRIBUTED TO ROTATIONAL GRAZING

- Holstein cows - 1,350 pounds average body weight
- Pasture - forage consists of a clover, bluegrass, orchardgrass mix
- Hay cost base (1992) - $85 per ton

Growing period: April 15 - June 15 (60 days)

Cows on system: 44 milking
26 dry cows and heifers

Reduction in feed per milking cow per day

	pounds	savings ($/cow/day)
grain	3.8	.30
hay equivalent	10.0	.43
Total savings		$ .73 per cow per day

Reduction in feed per dry cows and heifers per day

	pounds	savings ($/cow/day)
grain	3.0	.24
hay equivalent	8.0	.34
Total savings		$ .58 per cow per day

Total savings for 70 cows during 60 day period $2,832.00

Growing period: June 15 - Aug. 15 (60 days)

Cows on system: 41 milking
25 dry cows and heifers

Reduction in feed per milking cow per day

	pounds	savings ($/cow/day)
grain	0.0	.00
hay equivalent	5.0	.21
Total savings		$ .21 per cow per day

Reduction in feed per dry cows and heifers per day

	pounds	savings ($/cow/day)
grain	3.0	.24
hay equivalent	3.0	.13
Total savings		$ .37 per cow per day

Total savings for 66 cows during 60 day period $1,071.60

Growing period: Aug. 15 - Oct. 15 (60 days)

Cows on system: 44 milking
26 dry cows and heifers

Reduction in feed per milking cow per day

	pounds	savings ($/cow/day)
grain	3.8	.30
hay equivalent	10.0	.43
Total savings		$ .73 per cow per day

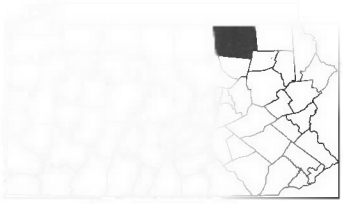
Reduction in feed per dry cows and heifers per day

	pounds	savings ($/cow/day)
grain	3.0	.24
hay equivalent	8.0	.34
Total savings		$ .58 per cow per day

Total savings for 66 cows during 60 day period $2,832.00

Total Savings for 180 Day Grazing Season $6,735.60

GARRY & LINDA VAN DE WEERT GRASSROOTS FARM BRADFORD COUNTY



ALTERNATIVE PASTURE SPECIES FOR INTENSIVE ROTATIONAL GRAZING

Garry and Linda Van De Weert operate a dairy farm in northern Bradford County near the New York state line. They have been farming on their own since 1988. Garry was raised on dairy farms in Virginia, New York and Pennsylvania. He has a wealth of practical experience. However, the way that Garry and Linda farm is a far cry from his dad's operation.

When they left the family farm, Garry and Linda moved to a rented farm near Rome, Pa., with $100 in cash. In February 1988, grazing specialist Roger Wentling took them on a trip to Somerset County. There they visited with dairy graziers, and Garry became convinced that rotational grazing was an ideal way to cut costs and farm land not suited to other crops. Linda was a little more cautious, but "Once we tried it, and I saw our feed bills compared to the home farm, I knew we were onto something," she says.

In the last four years, the Van De Weerts have purchased their own farm, expanded their herd to 90 milkers and have made remarkable progress in understanding pastures and the impact of grazing on a variety of plants. They have also managed to make dairy farming profitable using sustainable practices.

At the core of Garry and Linda's farming philosophy are two goals. The first is to try to keep costs down. They realize that they have little control over milk prices so the best way to make a profit is to minimize expenses while maintaining good milk production. The second goal is to grow the best possible forages in the most sustainable way. This supports the goal of profitability. In addition, the longer they can stretch the grazing season, the better off they will be. "Once we get into feeding in the barn in winter, every cost you can imagine goes up and our milk production [income] goes down," says Garry.

In defiance of research data released in the last 30 years, Garry's cows produce more milk on pasture and less when they are fed stored feeds indoors. He accounts for this by saying that the research for Pennsylvania was conducted primarily at Penn State University where, "They have ideal feeds grown on good soils and they use nitrogen fertilizers with little clover in their pastures." Garry has developed very good pastures, despite poor soils, but feels his stored feeds (hay and purchased grains) can't compete.

In addition to introducing them to Somerset County grazing farmers, consultant Roger Wentling put Garry and Linda in touch with Dr. Gerald Jung at the USDA Pasture Lab at Penn State University. Jung has been working with the Van De Weerts on various trials since 1988, the most extensive of which took place this past summer.

In general, the pasture lab is monitoring the Van De Weert pastures for forage quality (protein and digestibility) and yield of each species present. Pasture samples were taken weekly before the cows entered the paddock. Garry and Linda continue to make all decisions about how and when the pastures will be grazed, and they keep records of the number of animals per paddock, length of time in paddock, dates, etc. In addition, they have agreed to experiment with a number of forages not native to their pastures.

The "base" of the Van De Weert's system is their 50-acre natural pasture. In the spring of 1991, Garry broadcast birdsfoot trefoil onto the pasture but otherwise they have not introduced any plants. According to Garry, there are now six types of grasses in the "naturals" along with white clover, red clover and a very small amount of alfalfa. The legumes have appeared just since grazing was begun.

Garry and Linda have found that the plants that dominate in a

pasture will change according to grazing management. They are aiming for a 50/50 mixture of grasses and legumes, preferably white clover, because they feel this mix produces the most milk and keeps the cows in the best condition. They have been very pleased by the appearance of white clover in pastures all over the farm once grazing practices were begun.

One of the goals of the pasture lab research is to determine how many "cow days" of grazing can be obtained from each pasture plant, and the optimal time for each species to be grazed in the season. Garry recognizes that the longer the grazing season can be extended, the more costs are saved. He is convinced that in order to extend the grazing season and to provide for grazing in dry as well as wet years, a variety of plants must be used. In past years, Garry experimented with brassicas to extend grazing. However, he is now looking for perennial pasture plants.

Among the experimental pasture species this year on the Van De Weert farm were: Puna chicory, tall fescue, and three varieties and three types of brome grass. Garry also planted 20 acres of alfalfa and perennial ryegrass (Citadel) for hay and haylage.

Chicory

In 1988, the Van De Weerts planted one acre of Puna chicory. Puna, imported from New Zealand, is the only known forage variety of chicory. They and two other Somerset County farmers were the first in the United States to grow the forage variety. According to Garry, "The cows love it and milk heavily on it. They tried to crawl under electric fence to get to it!"

When Garry and Linda moved again in 1990, they planted a 10-acre section of chicory on the new farm. There has been a problem with winter heaving on poor soils, which they have tried to correct with a broadcast addition of mixed Reed canary grass to hold the soil better. Because the cows like this forage so well, another section was also planted on better soil.

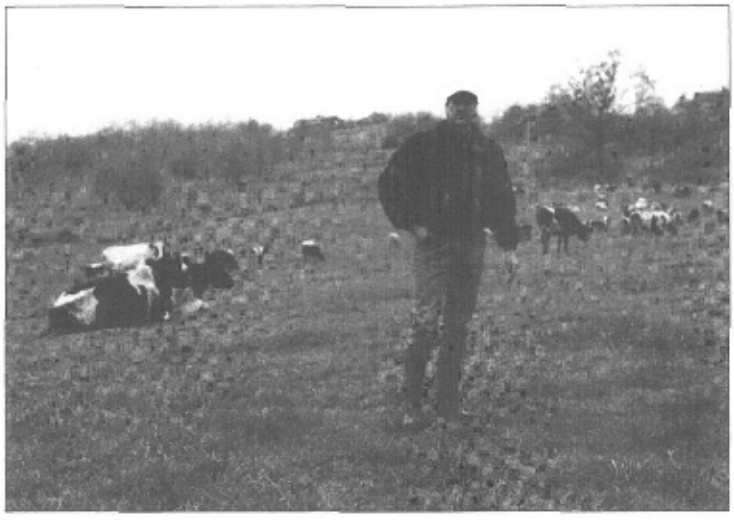
Research has shown that Puna is very nutritious, high in minerals and digestibility, and drought tolerant. Unfortunately, chicory is classed as a noxious weed in Pennsylvania. The Van De Weerts and a number of other farmers have obtained special clearance from the Pennsylvania Department of Agriculture to grow chicory, and they hope to see it removed from the noxious weed list in the future.

At present, however, they are trying to answer a number of questions about chicory, such as the best dates to begin grazing, level of closeness that needs to be grazed and how to encourage leaf growth rather than flower stem production that is not palatable to cows.

This summer, the 10 acres of chicory at the Van De Weert farm was divided into 12 strips and cows were allowed to graze one strip at a time, every other day. Grazing was begun on May 19. From this experiment, the Van De Weerts observed that chicory should be grazed early and hard, and then rested for 25 to 35 days. In the first six paddocks, the cows grazed the plants down to the ground and there was more leaf re-growth. In the later paddocks, more and more stem was apparent in re-growth.

Although there are always variables like weather and soils, Garry feels it is important to be able to tell farmers the best way to graze a particular forage. "From what we have seen, it appears that if chicory is not grazed this way (early and hard with sufficient rest), a farmer would not be pleased with it and might be likely to plow it under in the fall," he says. "That would be too bad because it can be one of the most productive plants on the farm."

Garry has not used chemical fertilizers on the farm, but at the request of the pasture lab, the chicory was fertilized in the fall of 1991 to promote better growth. Sixty pounds of nitrogen, phosphate and potash was added per acre. An extreme difference in the growth this past season was observed. Further research will be done to determine the economics of fertilizer use on chicory and how often it will need to be added. They do not plan to add any fertilizer this year.



Although the research is not conclusive, it points out some of

the advantages of chicory—palatability, milk and meat production, etc.—and some of the limitations—winter heaving, specific grazing "window" and need for added fertilization. Overall, the success of chicory points to many reasons for other farmers to try it and to put pressure on the state government to lift the ban on its use.

Tall Fescues

Tall fescues have been avoided by farmers due to an endophyte (fungus) that often appears in the leaf sheath of the plant. The endophyte protects the plant from predator insects, but also causes a reaction to occur in the plant that synthesizes chemicals that cause herd health problems such as lowered fertility, reduced dry matter intake, loss of hoofs and tail and reduction of live weight gain in animals that graze it. This occurs mainly in mid-summer.

Agronomists have been working to reduce this problem and have developed several endophyte-free varieties of tall fescue. Several varieties are currently being researched at University Park and three at the Van De Weert farm. It is hoped that the tall fescues can be used to extend fall grazing.

In 1993, approximately 50 pounds per acre of nitrogen will be added in September in half sections of the fescue plantings. Yield measurements will be taken afterward to see what the additional nitrogen accomplishes. Penn State experts speculate that they may need to add nitrogen in early spring as well to promote early growth.

The Van De Weerts planted 15 acres to fescues this year: five each of Festorina, Barcel and Johnstone. All are being grown with white clover. Festorina and Barcel are imports from Holland, and Johnstone is a Kentucky variety. All were tested previously at the pasture lab for palatability to dairy cows. Barcel rated very highly, as it has in Europe. Garry ended up grazing fescue he had intended to stockpile because he expanded his herd over the summer.

At this point, Garry is pleased with the fescues and doesn't differentiate between the varieties. "They all look like they will be very productive, the cows loved it, and we got good milk yield from those pastures," he says. He hopes to see increased growth next year.

Brome Grasses

The Van De Weerts have been experimenting with three types of brome grasses since 1990. Monitoring was done for yield and protein, just as in all of the other pastures. The brome grasses, planted in 1990, are Matua Prairie, Deborah Sweet and Baylor Smooth.

Garry is very excited about the Matua and feels it is the best grass on the farm. He says the cows like it better than the other bromes. "They tear it up at any stage, even in the seedhead," he says. Matua is a bit more delicate than some of the other grasses, and Garry has hurt it at times by regrazing too soon or overgrazing. "It must have 30 to 40 days of rest between grazing, even though it looks ready after 10 days. And it needs to have good stubble in the winter or it will winterkill," says Garry. However, he is convinced that "if you treat it right," it is the "best grass all the way around that we have found."

Alfalfa and Perennial Rye Grass

In the fall of 1991, the Van De Weerts planted 20 acres to an alfalfa/perennial ryegrass (Citadel) combination for hay and haylage. Garry chose rye because it matures at the same time as alfalfa and other grasses he has used do not. The rye is also less competitive and more digestible than orchard grass. A Penn State study found that ryegrass was 78-percent digestible, alfalfa was 73-percent and orchardgrass only 70-percent. At this point, Garry is very pleased with the results of this planting and recommends it highly as a good combination for hay.

At the request of the pasture lab, the alfalfa/rye mix was fertilized with 100 pounds of phosphate and 200 pounds of potash per acre after first cutting in 1992. Garry feels the fertilizer was worthwhile to insure the stand.

HERD CHANGES

Another experiment on the Van De Weert farm this year is the addition of a group of 30 registered Ayrshires. Previously, Garry was a "Holstein only" farmer who disliked any other breeds. Since 1988, however, he has been looking at other breeds to find animals that will better utilize pastures. Last summer, he added the Ayrshires to the 60 Holstein milkers already in his herd, and he has been extremely impressed by them.

"The Ayrshires grazed all day in the summer heat when the Holsteins were just standing around in a bunch. The Ayrshires required only half the grain of the Holsteins, they're more responsive, and so far, they seem to be more winter hardy," says Garry. Although the Holsteins produce more milk, Garry says they don't make him any more of a profit. He has a couple of Jersey/Holstein heifers entering the herd and would like to try breeding some Dutch Belted into the herd as well.

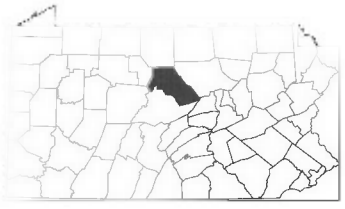
Garry is working toward seasonal dairying with the goal of having the whole herd freshen in the spring on pasture. He is convinced this will be healthier for the cows and likes the idea of a couple of months off from milking in the winter. He had hoped to achieve this goal by 1993 but the addition of the Ayrshires will add a year or two to his target date.

Garry has been frustrated by a lack of information on balancing feeds with pastures. He has found that he can cut elements that the nutritionists recommend with no drop in milk production. In 1990, with increased clovers in his pastures, Garry cut the added protein (soy or distillers) out of his ration and found that milk production went up. At this point, he feeds no added protein during the grazing season and very little in the winter because most of the cows are dry. He hopes to get to the point where added protein is another expense he can eliminate.

Another change made this year on the Van De Weert farm has been a decision to stop raising calves in any significant numbers. The Ayrshires were purchased for $800 a head, delivered to the farm, and Garry says it costs at least $1,000 or more to raise a calf to freshening. "It's just not worth it," he says. This also makes it possible for Garry to deal with a larger milking herd and concentrate on the cows and forage production.

The partnership between the USDA Pasture Lab at Penn State and Garry and Linda Van De Weert is unique and one that benefits both—as well as many other grazing farmers. The Van De Weerts feel greatly privileged to have access to the scientific knowledge of pastures and value the university's advice. They also appreciate the chance to try new pasture plants that might be unavailable otherwise.

CHARLES DOTTERER
CLINTON COUNTY



COMPARISON OF STARTER FERTILIZER RATES IN CORN GROWN FOR SILAGE

Charles Dotterer manages a commercial beef operation on 1,000 acres in partnership with his father, Ralph Sr., near Lamar. Dotterer Farm has been in the family for five generations and has evolved from work horse breeding to a dairy to its current 1,500-head beef operation. Charles raises more that 700 acres of corn, soybeans and barley and has utilized no-till since the early 1980s.

Charles is chairman of the Clinton County Conservation District, an active member of the Pennsylvania Farmers Association and a member of the local United Church of Christ.

"In the past, I was inclined to shoot for maximum yields, but with environmental concerns and economic constraints, I now feel the need to grow for the best optimum yields," Charles says. "We are driven by economics, but I try to keep a very open mind in order to find the best way to grow and harvest the crops we raise.

"I have been a long-time proponent of no-till farming as an excellent approach to soil conservation, but not necessarily to reduce chemical inputs. With the present imbalances in our crop rotations we may need to use some forms of tillage to alleviate some of the chemical and input costs associated with no-till corn culture.

"I have been suspicious of the fertilizer inputs required in no-till corn culture for optimum yields. That is one reason I got into this trial. I may look into tillage practices that require less fertilizer for optimum yield."

PROJECT COMMENTS

This ground has been in continuous corn for 20 years. It had manure applied every year except 1992. It has also had an occasional rye cover.

No other nitrogen was applied besides the starter. Penn State nitrogen soil tests for corn taken the second week of June indicated ample nitrogen levels were present.

"Weather was definitely a factor in the yield results," Charles says. "Spring was cold and dry, summer was wet and cool. This created a worst-case scenario for such a trial. Corn likes heat, and we didn't have any. Lack of additional starter fertilizer may not have provided the 'shot in the arm' needed to overcome the poor growing conditions.

"Visually, the corn without starter was slightly off in color and shorter in stature as late as the end of June. It did catch up when the soil warmed up. Weather had a lot to do with that. With warmer weather and average rain, the response to starter was less noticeable in soil where the fertility was ample. Cold weather had a definite impact on overall yields across the trial."

SITE INFORMATION

- Normal Rotation: continuous corn
- Previous Crop: corn
- Yield Goal for 1992: 25 tons/A
- 1991 Yield: 25 tons/A
- Site Size: Three acres
- Soil Types: Hagerstown
- Soil Test: pH - 6.6 OM% - N/A P - 418 #/A K - 524 #/A CEC - 9.6
- Note: Seven different hybrids were tested in alternating strips, with each hybrid receiving a treatment of starter and no starter fertilizer. All plots were chopped for silage and weighed.

MANAGEMENT AND INPUTS

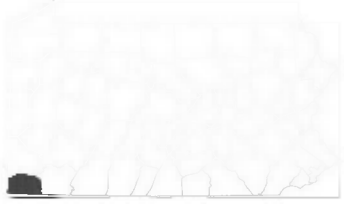
Date	With Starter Fertilizer	No Starter Fertilizer
5/2	Spray pre-plant herbicides 1 qt./A 2,4-D (Ester)	
5/7	Plant corn with no-till planter: All hybrids pop: 26,900 with 8.75 #/A Force &	
	75 #/A 10-34-0 starter fertilizer	No starter fertilizer
5/11	Spray post-emerge herbicides 2.5 qt./A Lasso, 3 qt./A Atrazine, 1.5 pt./A Gramoxone & 1 pt./A Surfactant	
5/20	Spray post-emerge herbicides 2 pt./A Prowl and .5 pt./A 2,4-D (Ester)	
6/25	Rescue herbicide treatment .5 pt./A Banvel	
10/16	Harvest silage	
	20.35 tons/A*	19.61 tons/A*

* Average yield of all hybrids

ECONOMIC RESULTS

Input/acre	With Starter	No Starter
Seed	$22.00	$22.00
Pesticide	59.02	59.02
Fertilizer	9.26	0.00
Machinery & labor	81.25	81.25
Total expenses	$171.53	$162.27
Gross income	$366.30	$352.98
- Expenses	171.53	162.27
Net return	$194.77	$190.71

LEIGH & LIKI SHIELDS GREEN COUNTY



ALTERNATIVE FLOWER AND HERB CROPS SUITABLE FOR SMALL FARMS

Leigh and Liki Shields, along with their five-year-old son Alex, own and operate Shields Greenhouse and Nursery in southern Greene County. Farming on secondary agricultural land, their farm is topographically more like West Virginia and sustained primarily through imagination and creativity. Leigh is a graduate of the Agroecology Program at University of California, Santa Cruz.

The Shields produce plants in commercial greenhouses and in the field on their 12-acre farm, specializing in herbs, perennials and dried flowers. They grow a wide variety of flowers that can be dried or sold fresh, stressing diversity as an important operating principle. Most years they produce three to four acres of annuals and two acres of perennials. All their plants are started in the 6,000 square feet of greenhouses.

"We are organic and produce under the ecological tenet of 'Diversity leads to Stability,'" says Leigh. "We raise bedding plants and dried plant materials, assembling them in dried bunches, or as 'Designs by Liki.' We sell plants out of our greenhouse, arrangements from our retail shop, and ship wholesale around the country."

DEMONSTRATION RESULTS

This demonstration was conducted to study the economic returns of an integrated, ornamental multi-crop system utilizing organic and labor intensive methods of soil fertility and weed control.

The demonstration plot was one acre. This field has received approximately 30 tons of fresh long straw horse manure each year since 1985. The manure is tilled in with a John Deere rear tiller. Lime is also applied each year at two tons to the acre. Costs for manure and lime applications on the demonstration plot for 1992 totaled $200.

Initial tillage occurred in April, with a second tillage right before planting. All plants were started in the greenhouses and transplanted out as seedlings; plantings were in four-foot-wide beds, with two and three rows per bed. An initial hand cultivation with stirrup hoe between plant rows was followed on most of the plot with a heavy straw mulching for weed control and water conservation.

The field was divided into four separate plantings: 1.) artemisia annua or sweet annie, a very large aromatic herb which dries green, was the major cash crop; 2.) salvis faranacea or larkspur; 3.) celosia or cockscomb; 4.) a section planted to helichrysum or strawflower and mixed herbs and assorted flowers.

All crops are sold through an integrated marketing program that utilizes them in various whole plant and component configurations. This makes it difficult to track exact returns per plant. For the purpose of this demonstration, sweet annie was used to provide a representative example of relative returns.

The sweet annie was planted in staggered rows, three feet apart, with in-row spacing of three feet. About 700 plants were planted in the quarter acre. Rows were tilled twice and hand-hoed once by July 20. Mulch was not applied to sweet annie this year. Approximately 65 hours of labor were applied to this quarter-acre section of the plot for tillage, fertilization, planting, weed control, irrigation and harvest. Additional labor was utilized in propagation of the plants.

Sweet annie was harvested from mid-September until Nov. 1, through heavy frosts. Approximately 650 of the 700 plants set out on the quarter acre were harvested saleable. Sold out of the field, the whole plant sells for $5 a bush. Fresh bunches also sell for $1-3 and later, dried bunches sell for the same. The plant is also used in decorative arrangements throughout the year for wholesale and retail trade.

ECONOMIC DATA

- Sweet annie (Artemisia annua)
- 700 plants per quarter acre

- 650 sold direct from the field at $5.00 each
- Total: **$3,250.00**

* Plants can also be sold dried or fresh in bunches for $1.00 to $3.00 each.

PROJECT COMMENTS

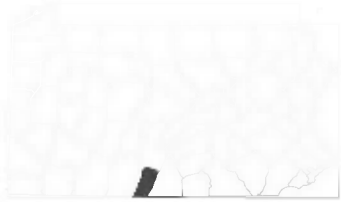
"We are sort of the alternative to the alternatives," says Leigh. "We decided we needed to grow crops that weren't being grown and that had high return with the right marketing. Not everybody can keep growing corn year after year in today's world. I think that our program, while not duplicable everywhere, can get people to stretch their thinking about alternatives open to them that can utilize sustainable production techniques and make them money.

"Sweet annie is a very good crop for us, but only because we have a mix of crops—a diversity. In that sense, we are vertically integrated. We generate our own material, grow the plants, create our own markets, and have a designer capable of adding value to our crops.

"Weather is never normal, but this year was truly abnormal. In our 12 years as farmers, weather gave us the biggest problems this year. June drought, a June 21 frost, record July rains, and all summer record lows for temperature and sunshine left us with very unsatisfactory results in many plantings, including sweet annie. We figured them to be only seven feet tall instead of the normal eight feet. We can live with that.

"Our organic methods may be more costly in the short term due to higher labor costs, but I think in the long term they make this business viable. Our weed control in particular takes a lot of hand labor, and I am sure that herbicides would be cheaper on a one-year horizon. But the first crop of weeds that come in after harvest, mostly amaranths, are vigorous soil builders, pulling up nutrients to the surface. Good soil keeps the insidious weeds out. I work them in like a cover crop along with the other residues. I think they are important to building soil. And our customers like the fact that we don't spray."

WARD SINCLAIR & CASS PETERSON FULTON COUNTY



Cass Peterson and Ward Sinclair own and operate 65 acres outside Warfordsburg known as "Flickerville Mountain Farm." They grow a variety of vegetable and specialty crops and market their products directly to consumers. Peterson and Sinclair travel quite a bit to capture as many markets as they can and experiment with exotic vegetables that appeal to urbanites. "Most customers want a wide range of products that heretofore came from some distant place," Ward says. "[Farmer's markets serve as] a great lever for economic development by stimulating agriculture on a local and regional basis."

In addition to farming and marketing for ten months of the year, Sinclair and Peterson also find time to help further sustainable agriculture locally and nationally. Cass serves as PASA's vice president, and Ward is on the board of directors of the Institute for Alternative Agriculture.

ALTERNATIVE PRACTICES TO CONTROL EARLY BLIGHT IN MARKET TOMATOES

DEMONSTRATION

Alternaria, or early blight, is one of the most damaging tomato diseases, forcing the use of fungicidal sprays among conventional growers and often causing great loss in yield and quality for chemical-free growers.

Among organic growers, early blight is controlled largely through cultural techniques aimed at preventing or lessening the disease, such as trellising to promote free air circulation. Liquid copper sprays are sometimes used to slow the progress of the disease.

This demonstration was aimed at testing the effectiveness of hydrogen peroxide (H_2O_2) against early blight, drawing on our experience and that of other growers who have found H_2O_2 useful in combatting other fungal diseases such as peach leaf curl and powdery mildew.

The demonstration patch was approximately 26 feet wide and 300 feet long. It was planted to four tomato cultivars: Early Girl, Jetstar, Park's Whopper and Good 'n' Early. The tomatoes were set two feet apart into black plastic mulch on April 22 and covered with a spun-bonded polyester row cover as frost protection. The plants were not trellised or caged. The patch was equipped with T-tape drip irrigation.

Flags were set into each row of tomatoes to separate them into four sections containing approximately 40 of each cultivar.

Section A was sprayed at the rate of one tablespoon of food-grade (35%) H_2O_2 per 10 gallons of water immediately after transplanting and weekly thereafter.

Section B was sprayed weekly for four weeks with H_2O_2 at the same dilution, starting on July 14, when the first symptoms of blight were observed.

Section C was sprayed weekly for four weeks with liquid copper at manufacturer's recommended rates starting July 14.

Section D received no treatment for early blight.

The tomatoes began yielding ripe fruit on July 18.

RESULTS

It was determined that the most effective anti-blight measure was H_2O_2 applied on a weekly basis starting at the time of planting. Second most effective was liquid copper applied weekly for four weeks after blight symptoms were observed. The patch that received H_2O_2 after blight symptoms were observed suffered as much damage as the patch that received no treatment at all.

There was a significant difference in blight damage on the different cultivars. Early Girl (extremely susceptible to blight) was hard hit, even in the section that was preventatively sprayed with H_2O_2. Park's Whopper and Jetstar showed significantly less damage, even in the control section.

Yield losses were heavy on Early Girl and Good 'n' Early—approximately 50 percent—even in the preventatively sprayed section. Jetstar losses in that section were estimated at 30 percent and Whopper at 20 percent.

In the section treated with liquid copper, losses were estimated at 60 percent on Early Girl, 70 percent on Good 'n' Early, and 40 percent on Whopper and Jetstar.

Section B, which was treated with H_2O_2 after the onset of blight, and Section D, the control, suffered losses of 75 percent on Good 'n' Early and Early Girl, and 50 percent on Jetstar and Whopper.

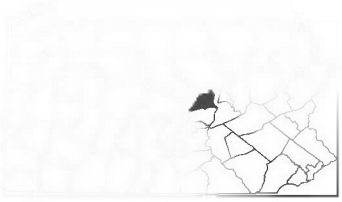
Of the four cultivars, only Whopper was still producing marketable tomatoes on Sept. 8, when a severe hail storm definitively ended the experiment.

While the losses to early blight were substantial even in the section preventatively sprayed with H_2O_2, the results are encouraging. The cool, wet spring of 1992 provided ideal blight conditions. In similar years, losses at the Flickerville Mountain Farm have approached 100 percent on some cultivars.

PROJECT COMMENTS

"We believe that H_2O_2, in addition to being inexpensive, has a much lower ecological profile than liquid copper," says Ward. "We intend to continue experimenting with slightly higher concentrations of H_2O_2 and to combine the treatment with standard cultural techniques such as trellising."

PRESTON & WANDA BOOP BRIARPATCH FARMS UNION COUNTY



COMPARISON OF MECHANICAL WEED CONTROL TECHNIQUES IN ORGANIC SOYBEANS

Preston and Wanda Boop run an organic grain and beef operation in Buffalo Valley in northern Union County. The farm has been in the family for three generations. Their three farms total 350 acres, of which 200 are used to grow corn, soybeans and small grains. Approximately 30 acres are in a rotational grazing system. They have been certified organic since 1988.

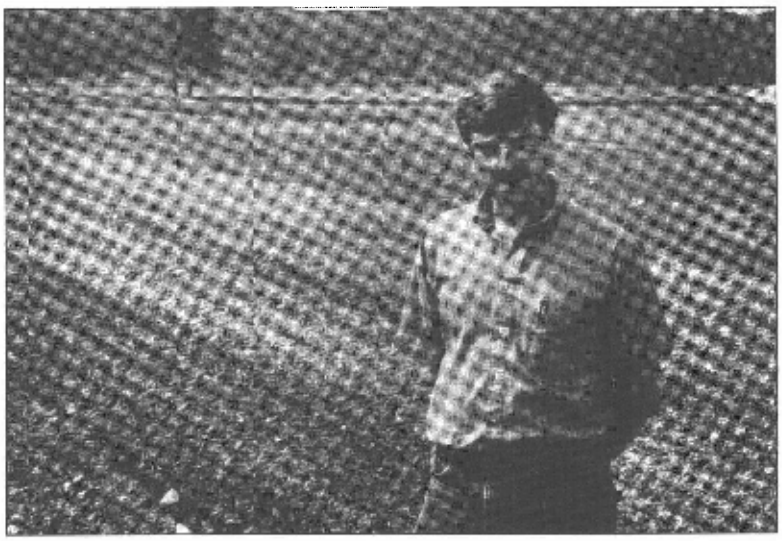
Preston has developed an extensive composting system that provides all the soil nutrients for BriarPatch Farms. Utilizing poultry house manures, cattle manure and municipal leaves from a nearby town, Preston generates 2,000 tons of compost per year. In 1992, he and Wanda purchased a commercial compost turner and are looking toward a customized spreader for 1993.

Preston has served as the president of Pennsylvania Association for Sustainable Agriculture since its inception. He is a member of and certification chair for the Pennsylvania Chapter One, Organic Crop Improvement Association. He is also active in the Pennsylvania Builders Association and serves on the Mifflinburg District School Board and the Buffalo Township Zoning Review Board.

PROJECT COMMENTS

"In the past, we have found the rotary hoe to be a very effective tool for controlling weeds in soybeans," says Preston. "However, this year's poor bean germination and late wet weather brought on excessive weed growth and control became a serious problem in these plots. Good germination and quick canopy is essential for this type of weed control to work and we just didn't get that this year. We fared somewhat better on a similar plot that was row-cultivated and rotary hoed.

"Despite the poor performance of this demonstration, my commitment to sustainable farming practices continues to grow stronger by the ever-improving soil conditions and increased fertility. The weed residue we had this year will be plowed down and become part of next year's organic nutrient supply. This, along with cover crops, composted poultry manure and leaves from a local municipality, makes soil conditions a little better each year."



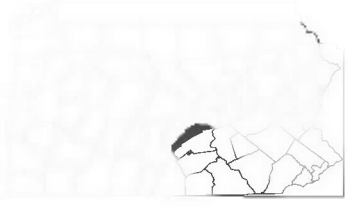
SITE INFORMATION

- Normal Rotation: corn, soybeans
- Previous Crop: corn
- Yield Goal for 1992: 40 bu./A
- 1991 Yield: 51 bu./A
- Site Size: 10 acres
- Soil Types: Watson
- Soil Test: pH - 6.5 OM% - 4.3 P - 140 #/A K - 300 #/A CEC - 7.1

MANAGEMENT AND INPUTS

Date	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Dec 91	Chop corn stalks			
Apr'92	Spread composted chicken manure, 5 tons/A			
4/16	Chisel plow			
4/20	Disk harrow sow oat cover crop, 1.5 bu./A			
6/20	Harrow and cultipack Drill soybeans in 7" rows, Pop: 80 #/A			
6/27	Rotary hoe			
7/4		Rotary hoe		
7/11			Rotary hoe	
7/18				Rotary hoe
9/12	Overseed rye cover crop, 2.5 bu./A			
12/9	Harvest beans			
	15 bu./A	12 bu./A	12 bu./A	12 bu./A

EDGAR & LORRAINE RITS JUNIATA COUNTY



INTENSIVE ROTATIONAL GRAZING TO ESTABLISH PASTURE IN OLD HAYFIELDS

Ed and Lorraine Rits own and operate a 200-acre livestock and crop farm near Honey Grove. The farm has been in the Heckman (Rits) family since 1887. Present crops are corn, oats and rye, with 45 acres of hay and 25 acres of pasture.

After selling their dairy herd in 1987, the Rits worked to develop a debt-free beef operation with all cows spring calving under a controlled intensive rotational grazing system. They plan to expand their herd from 15 to 30 animals in 1994. Ed, formerly a professional soil conservationist, is self-employed as an agricultural consultant. He also serves as secretary of the local Crop Management Association, is a director of the State CMA and co-chairs the Pennsylvania Association for Sustainable Agriculture's on-farm activities committee.

"My primary interest, in addition to the usual erosion control practices, is trying to implement alternative sustainable farming practices on our farm," Ed says. "This comes from a personal desire to use on-farm resources wisely and reduce purchased inputs. I use personal experience to relate to other farmers having similar interests. Since 1976, I have used several crop rotations, cover crops (rye, hairy vetch, red clover), minimum-till, no-till, animal manures and composted manures, Integrated Pest Management, non-mechanical land clearing, alternative crops (lupin beans, buckwheat, rye) spinner seeding, frost seeding, intensive controlled rotational grazing and re-established grasses/legumes on cropland without seeding."

METHODS

In Pennsylvania, many old hayfields have the potential to be renovated into productive pasture with a little fertility and the right management. If done correctly, naturally occurring species will re-establish themselves under intensive grazing, doing away with the need for mechanical seeding.

In the spring of 1991, an old 2.5-acre hayfield infested with ragweed was selected as the demonstration site. In early May, half the field was sprayed with Round-up at the recommended rate of one quart per acre. This controlled the ragweed.

The field was bare until about June 10, when it started to green up with foxtail seedlings. The field was mowed for foxtail about July 15 with the idea of being able to graze the field. Fences were put up and this field was intensively grazed along with the adjacent hayfields beginning on Aug. 1, moving the fence every three days until the entire area had been covered.

The cows made a second grazing pass the first week of September and a third the second week of October. Broiler house manure was spread on the field at one and one-half tons per acre on Oct. 15.

In December, the cows had made a final grazing pass. Very little growth had occurred in the period from October to December.

Soil samples were taken from the site showed a pH of 6.3. Three thousand pounds per acre of lime were applied on Feb. 11, 1992. Phosphate and potash levels were also low (67 pounds per acre P and 197 pounds per acre K). One hundred-ten pounds P_2O_5 and 60 pounds of K_20 were applied in the form of poultry manure. This was based on the recommended application rate for a no-till planting of alfalfa with a yield goal of four tons per acre. Rainfall for the period from November 1991 to March 1992 averaged two inches per month.

In March, the fields were divided into two sections (A and B) and laid out 11 treatment strips. Six (strips 1-6) were 12 feet wide by 750

feet long running along the entire upper half of the demonstration site (Section A). Five (strips 7-11) were 12 feet wide by 150 feet long. These shorter strips only took up part of the lower half of the demonstration site (Section B). Nine of the 11 strips were frost-seeded with different pasture mixes on March 16, 1992 using a three-wheeler with an electric powered spinner-spreader. Two strips, along with a the remainder of Section B, were intentionally left unseeded. Alfalfa was seeded at 20 pounds per acre, red clover at 10 pounds per acre. Ladino clover and birds foot trefoil were also seeded at 10 pounds per acre. White dutch clover, although recommended for seeding at the a rate of four pounds per acre, was actually spread at approximately 25 pounds per acre due to a problem with the seeder. Linn ryegrass was seeded at the rate of 10 pounds per acre.

Demonstration Site

1 White dutch clover			SECTION A
2 Alfagraze and ryegrass			
3 Oneida			
4 Nothing			
5 Spredor II and ryegrass			
6 Birdsfoot trefoil			
Nothing planted	Ladino	7	SECTION B
	Alfagraze	8	
	Nothing	9	
	Spredor II	10	
	Red clover	11	

Strips 1 - 6: 12 x 750' = .2 A
Strips 7 - 11: 12 x 150' = .04 A

The conditions for frost-seeding were perfect. March 16, 1992, was a very cold morning with temperatures of 15 degrees Fahrenheit gradually warming to 35 degrees by mid-afternoon. The morning temperature in March 17 was about 16 degrees and mid-afternoon about 35 degrees. March 18 was about 25 degrees and mid-afternoon was in the mid-40s. The soil honey combed on March 17 and 18.

April was a cool and moist month with more than four inches of rainfall. This resulted in a good growth of grasses and wild mustard. On April 27, a Juniata Valley Crop Management Association technician observed that there were many small broad leaf plants at about the one-eighth inch, two leaf stage growing in all the strips throughout section A and B, but they could not be identified as weeds or legumes.

On May 12, clovers, alfalfas, and birdsfoot trefoil one-fourth to one half inch in size were observed in bare spots and underneath the mustard.

The Linn rye grass was three inches tall in the various plots. Old, established grasses (quack, orchard, rye, timothy, blue, tall fescue, etc.) were growing rapidly and were 10 to 30 inches tall in places.

The plan was to lightly cross-graze these strips, however, heavy rains on May 13, 14 and 15, and then haymaking in adjacent fields delayed this. On May 25, the strips were cut with a rotary mower.

On June 18, 1992, 14 cow/calf pairs and a bull were allowed to lightly cross-graze Section B, including strips 7 to 11. The cattle generally ate the old grasses, taking off the new top growth, but when they got to the seeded plots, they ate the new seedlings first, and then the tops of the old growth. The strips 1 to 6 in Section A were cut with a rotary mower to stand approximately four inches high. All plots were cut again with a rotary mower on July 29, 1992.

On Aug. 27, 1992, a JVCMA yechnician evaluated each plot as follows:

Plot	%Planted Crop	% Red Clover	% Grass	% Weeds and natural regrowth
1	10-white clover	25	30	30-planton, carrot, rag, foxtail
2	0-alfalfa 5-ryegrass	25	10	30-planton, carrot, rag, foxtail 30-white clover
3	0-alfalfa	20	20	60-planton, carrot, rag, foxtail
4	nothing planted	15	20	65-planton, carrot, rag, foxtail
5	0-alfalfa 0-ryegrass	20	20	60-planton, dogbane, white clover
6	5-birdsfoot trefoil	20	25	50-planton, foxtail, carrot, white clover
7	25-ladino clover 20-ryegrass	30		25-planton, foxtail, carrot
8	0-alfalfa	35	15	60-planton
9	nothing planted	50	15	35-planton, foxtail
10	5-alfalfa 10-ryegrass	20	20-orchard grass	45-planton, foxtail, white clover
11	35-red clover		40-orchard grass	25-planton, white clover

On Sept. 1, 1992, 15 cow/calf pairs, four bred heifers and one bull (27,000 pounds total) were allowed to graze Section B, including plots 7-11, and were removed on Sept. 2. On Sept. 3, 1992 these same animals were allowed to graze Section A (plots 1-6) and were removed on Sept. 4.

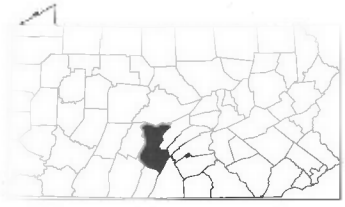
By Oct. 1, 1992, there were eight to 10 inches regrowth of the red clover and grasses. There was nearly a 100-percent ground cover of clovers and grasses. There were very few weeds, as had been observed on Aug. 27. The final grazing occurred from Nov. 2 to 11, 1992.

PROJECT COMMENTS

"Based on the results of this first year (the establishment year), it would appear that it is not necessary to plant high-priced seed to establish forages on former hay ground that can be intensively grazed. Although many of the species that we seeded in the spring did not do well, this field had a seed bank of pasture species (particularly red clover), that when grazed, established themselves beautifully," Ed says. "This appears to be an excellent, low-cost means of pasture establishment that many livestock producers could use.

"For the next several years, the treatments in this plot will be grazed in rotation along with the other paddocks. The vegetation types and growth will be observed and documented. It is anticipated that the management applied to this field will result in continued pasture improvement without the use of commercial inputs or pest control products."

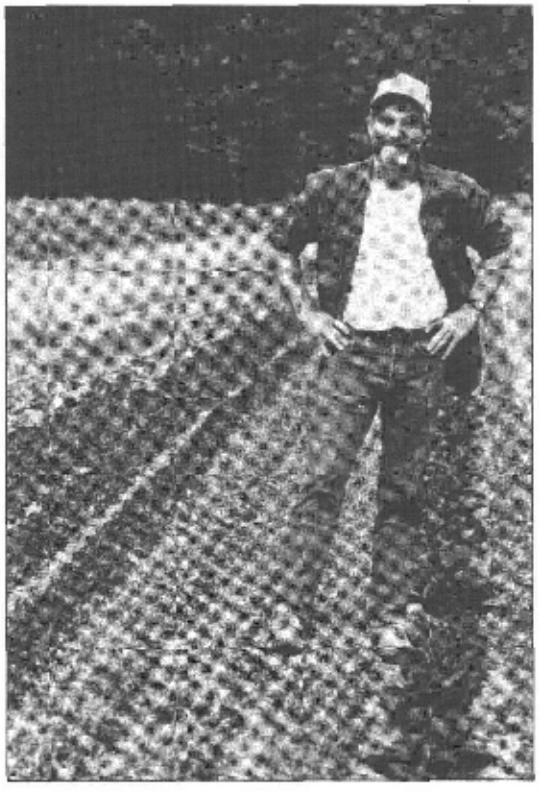
JIM & MOIE CRAWFORD HUNTINGTON COUNTY



Jim and Moie Crawford run an Organic Crop Improvement Association certified operation that produces more than 30 varieties of vegetables and small fruits on 20 acres. Their crops are marketed through the Tuscaurora Organic Growers Coop (which they helped to start) and at neighborhood markets throughout the Washington, D.C. area.

New Morning Farm employs five full-time apprentices and up to 10 hourly workers during the busy season. 1993 will be the Crawford's 18th season on the farm.

ALTERNATIVE PRACTICES TO CONTROL EARLY BLIGHT IN MARKET TOMATOES



PURPOSE

To reduce fruit and foliar damage from early blight in a certified organic, fresh market tomato crop.

GENERAL DESCRIPTION

Field tests were conducted using four sprays, alone and in varied combinations. Tomatoes were transplanted June 4, two feet apart, using healthy seedlings started in the greenhouse. All beds were covered in black plastic, and were mulched with hay between beds. Plants were not staked. Two varieties—Paragon and Celebrity—were used in the tests, each variety having all sprays applied. All tomatoes were sprayed with copper sulfate on June 29 and July 6 before commencing test program sprays.

The sprays used were copper sulfate, hydrogen peroxide (H_2O_2), iron chelate, "Maxicrop"— a seaweed foliar feed product—a mixture of half copper and half H_2O_2, and half iron with half maxicrop. In all, six different sprays were applied on each variety, and a control plot was left unsprayed, totaling seven plots for each variety. Approximately 16 plants were in each plot, spanning four rows with a buffer of one plant between each plot.

Test Plots and Spray Concentrations

1 Control—no sprays
2 Copper sulfate: 2T./ gal.
3 Hydrogen Peroxide: 1T./gal.
4 Half copper sulfate, half hydrogen peroxide
5 Iron chelate: 6 T./gal.
6 Maxicrop: 1 T./ gal.
7 Half iron chelate, half maxicrop

* Each plot was sprayed on the following dates: July 13, July 22, Aug. 3, Aug. 12 and Aug. 21.
* In addition to the test chemicals, one-half teaspoon of "Necessary Organics" spray enhancer was added to each gallon of water.

OBSERVATIONS

Observations were made five times. Foliage and fruit health and appearance were scaled from A to E, A representing excellent condition having less than 10-percent disease, incrementally to E.

Plot	Foliage 8/21	Foliage 9/3	Foliage 9/11	Fruit 9/15	Foliage & fruit 9/21
1	A	C	E	B+	E
2	A+	A-	A-	A+	B-
3	A	C-	D-	B+	D-
4	A	B	C	A-	C
5	B	C-	E	C-	E
6	D	D	E	E	E
7	B	C	E	C-	E

PROJECT COMMENTS AND CONCLUSIONS

"It appears the copper sulphate was the only spray that had a significant positive impact on the health of the plants," Jim says. "The hydrogen peroxide had a minimal effect, with almost no pickable tomatoes on Sept. 21. If the spraying had continued past Aug. 21, the H_2O_2 plot would most likely have had some pickable fruits. This is judged by the good condition they were in on Sept. 15.

"The copper sulphate produced a dramatically more healthy crop than any other spray. The foliage survived fairly well throughout the season, while almost everything else had died. If spraying had continued past Aug. 21, we believe the fruits would have been healthier.

"Starting the spraying process earlier (with copper sulphate only) and continuing throughout the entire season is recommended for future testing. Having the plants more upright would have allowed for more uniform spraying."

American Farmland Trust
Sustainable Agriculture Program

"Land," said Aldo Leopold, *"is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants and animals."*

Unfortunately, many of the farming practices commonly used by agricultural producers over the last few decades have severely altered this biological "circuit." Soil erosion and sedimentation, the widespread contamination of ground and surface waters and the loss of wildlife habitat ...all are serious problems that, in part, stem from man's agricultural activities.

Sustainable agriculture is an alternative approach to crop and livestock production that encourages the use of practices that do not degrade land or water resources. Sustainable farming methods make better use of biological assets and reduce overall reliance on purchased agricultural inputs.

On-farm research and demonstration projects conducted in recent years throughout the U.S. have proven that sustainable farming systems work and are as productive and profitable as conventional systems.

American Farmland Trust is a private, nonprofit membership organization founded in 1980 to protect our nation's farmland. AFT works to stop the loss of productive farmland and to promote farming practices that lead to a healthy environment.

The **Sustainable Agriculture Program** works with agricultural producers to promote alternative farming systems that are practical, profitable and environmentally sound. To accomplish this, staff work in three program areas:

- Assistance to grassroots organizations: AFT assists in the establishment of farmer-directed groups that play a fundamental role in promoting sustainable agriculture.

- Advocacy: AFT promotes the development of public policy and programs that support alternative farming systems at the local, state and federal levels.

- On-farm demonstration and research projects: AFT makes financial and technical assistance available for farmers to experiment with alternative production techniques.

In addition, the Sustainable Agriculture Program provides educational opportunities for farmers. Workshops, field days, conferences and publications are all part of this effort.

The Sustainable Agriculture Program has formed partnerships with farmer groups like the Illinois Sustainable Agriculture Society, the Indiana Sustainable Agriculture Association, the Michigan Agricultural Stewardship Association and the Pennsylvania Association for Sustainable Agriculture. Successful on-farm demonstration projects in these states have also been established. New sustainable agriculture projects are now being developed throughout the nation.

In 1991, AFT received the President's Environment and Conservation Challenge Award for its work in sustainable agriculture.

As we advance into the future, we must increase our efforts to become better stewards of the land. American Farmland Trust is committed to this philosophy. The Sustainable Agriculture Program will continue its efforts to promote alternative farming systems, so the resource base that supports us all can remain productive for many generations to come.

Pennsylvania Association for Sustainable Agriculture

The Pennsylvania Association for Sustainable Agriculture is a coalition of Pennsylvania farmers, consumers, industry and educators working toward the development of sustainable food and farming systems.

PASA welcomes everyone who is interested in food production systems that sustain farms and farmers, soil and water, people and communities, now and for the future.

PASA was founded in 1992 to link and represent the growing sustainable agriculture interests within the state. It is the first statewide organization dedicated to promoting organic and sustainable agriculture.

The purpose of the Association is to develop, support and promote sustainable food and farming systems that are economically viable, environmentally sound, scientifically based and community oriented.

By joining PASA, you will be helping to support the growing network of people involved in environmentally sound, sustainable food production, marketing, research and education. You will also be adding your voice to the coalition of thousands of Pennsylvanians who are creating innovative techniques, policies and markets in support of sustainable agriculture.

PASA Membership Application

Name _____

Address _____

_____

County _____

Phone _____

Membership Category (check one)

Individual/Family/Farm	$25	_____
Non-profit Organization	$50	_____
Business	$150	_____
Sustaining member	$500	_____
Student	$10	_____
Other	$( )	_____

Please clip and return to:

PASA
P.O. Box 316
Millheim, Pa. 16854
(814)349-9856

Pennsylvania Association for Sustainable Agriculture
P.O. Box 316
118 West Main Street
Millheim, Pa. 16854
(814)349-9856

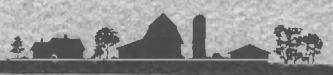
The Pennsylvania Association for Sustainable Agriculture is a coalition of farmers, consumers, industry and educators working toward the development of sustainable food and farming systems. PASA is partially supported by membership donations.

American Farmland Trust
Center for Agriculture in the Environment
P.O. Box 987
DeKalb, Ill. 60115
(815)753-9347 (phone)
(815)753-2305 (FAX)

American Farmland Trust is a private, nonprofit membership organization founded in 1980 to protect our nation's farmland. AFT works to stop the loss of productive farmland and promote farming practices that lead to a healthy environment. Annual membership is $20.

American Farmland Trust
P.O. Box 987
DeKalb, IL 60115

Nonprofit Organization
U.S. Postage
PAID
DeKalb, IL 60115
Permit # 134



American Farmland Trust
National Office, 1920 N Street, NW, Suite 400, Washington, D.C. 20036
(202)659-5170 (phone) (202)659-8339 (FAX)