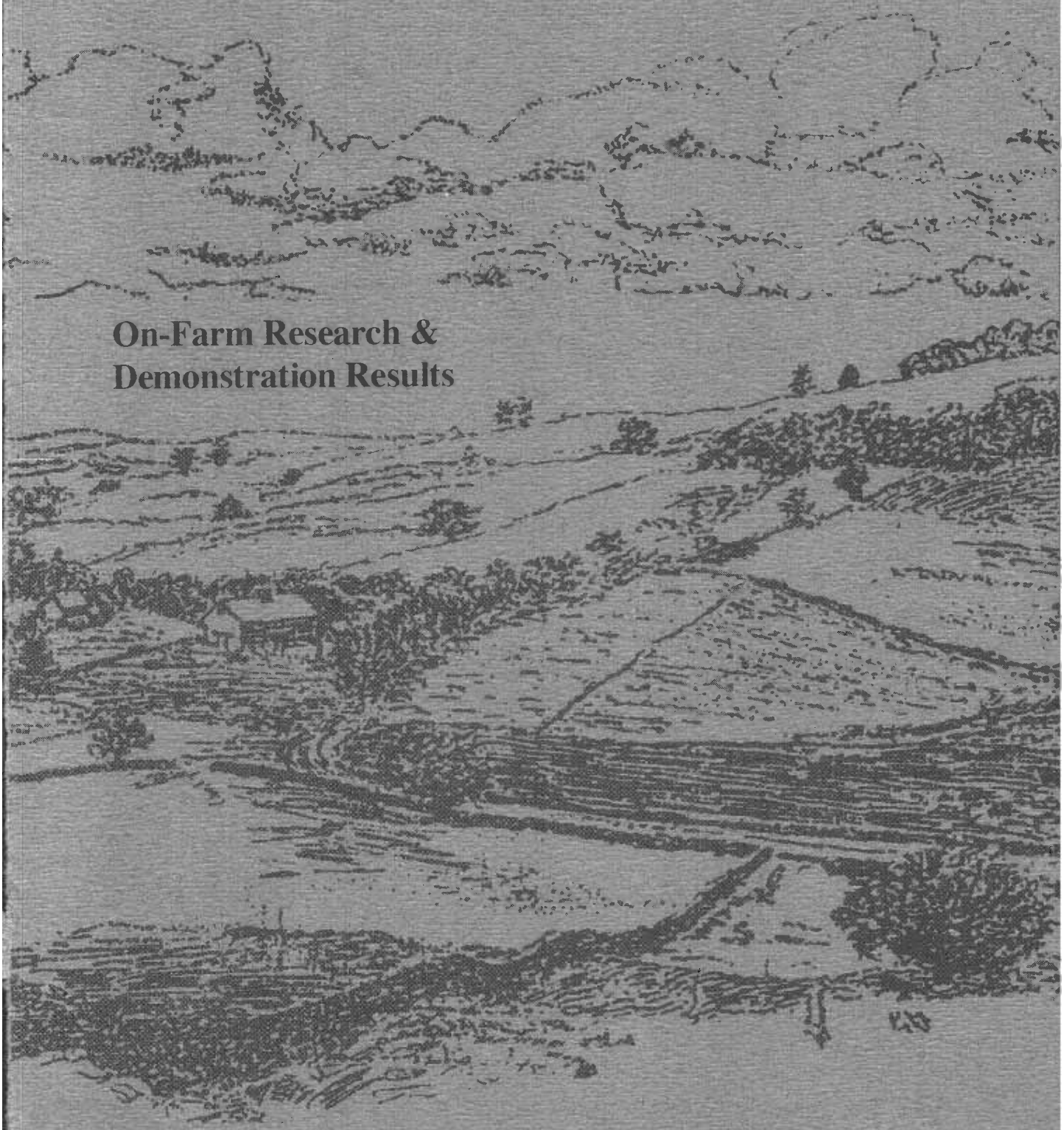
Pennsylvania Sustainable Agriculture Project -- 1993



On-Farm Research & Demonstration Results

American Farmland Trust
and Pennsylvania Association
for Sustainable Agriculture

Funding for this project has been provided by the

PHILIP MORRIS COMPANIES, INC./KRAFT GENERAL FOODS
and
THE PEW CHARITABLE TRUSTS.

Thanks to the entire PASA On-Farm Activities Committee for soliciting, reviewing, and selecting proposals.

Betsy Lyman, Rodale Institute, committee co-chair
Edgar Rits, Rits Consulting Service, committee co-chair

Special thanks to the following committee members who acted as coordinators for selected demonstrations and field days:

Lee Bentz, Pennsylvania Deptartment of Agriculture
Wanda Boop, BriarPatch Organic Farms, Union County
Kevin Blake, USDA-SCS, Northumberland County
Devon Howe, Elizabethtown
Tony Ricci, Green Heron Farm, Huntingdon County
Phil Rzewnicki, Cooperative Extension, Blair County
Joe Schott, Lebanon
Jesse Weaver, Agri-Basics Soil Service, Lebanon
Leon Weber, Rodale Institute

For additional technical assistance, special thanks to:

Eric Carlson, Headwaters R C & D
Ellen Dietrich, USDA-SCS, Clinton County
Dave Messersmith, West Branch Crop Management Association
Suzy Funka-Petery, USDA-SCS, Greene County
Bryan Petrucci, American Farmland Trust
Paul Shaw, Walnut Acres Organic Farms
Terry Simkins, USDA-SCS, Potter County

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

Pennsylvania Association for Sustainable Agriculture
114 West Main Street, P. O. Box 419, Millheim, PA 16854

Printed on recycled paper with soy ink.

Cover designed by Carin Mizera.
Report designed and produced by Averie Clark.
Report edited by Timothy Bowser and Bryan Petrucci.

Pennsylvania Sustainable Agriculture Project -- 1993

On-Farm Research & Demonstration Results

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

TABLE OF CONTENTS

INTRODUCTION

In today's agriculture, maintaining farm profitability, environmental quality and community viability are issues of major concern to both farmers and the non-farm public. The health of each of these factors provides us with some measure of how our society is doing, and is an indicator of the sustainability of our overall support systems. Farmers across the nation are re-evaluating the impact of food production on people and the environment. Largely, they are learning that it is often more profitable to substitute information and management for purchased inputs and capital. This trend toward enhanced environmental responsibility and economic viability is occurring at an unprecedented rate in all parts of this country, and in all sectors of agriculture. It is a move toward sustainable agriculture.

> "Sustainable agriculture is an investment in future food production and communities that is economically viable, ecologically sound and socially responsible."
>
> — PASA, 1993

Sustainable farming systems are highly integrated, information-rich operations combining skilled management, biological diversity, innovative marketing and a high degree of flexibility with good stewardship and a long-term vision for land and people. Practitioners of sustainable agriculture manage the farm profitably today, for tomorrow's generations.

During the 1993 growing season, PASA continued a collaborative effort with American Farmland Trust to help farmers experiment with and demonstrate some of the component practices of sustainable agriculture. This collaboration formed the basis for the Pennsylvania Sustainable Agriculture Project - 1993. Sixteen farm-based demonstration sites located in counties throughout the Commonwealth were established with cooperating farmers. These demonstrations were designed to address issues in farm management that emphasized reducing impacts on water quality, building and maintaining soil health, improving farm profitability and enhancing the rural economy.

The information presented in this year's publication was collected from cooperating producers throughout the year. It is intended to give the reader an idea of what sustainable agriculture looks like when new practices are applied to actual farming operations. It can also help farmers better understand how these concepts can be applied to many different farms, especially their own.

Any new practice or farming technique should be applied on a small-scale basis first. If something in this publication appears to have applicability to your farm, try it on a few acres before making any conversions. Each farm is different, and the information documented here is true for one farm in a given year. Evaluate these concepts for your situation and modify the practices to fit your farming operation.

PARTICIPANTS IN
THE PENNSYLVANIA SUSTAINABLE AGRICULTURE PROJECT - 1993

Blair County
David & Terry Rice
RR 2, Box 205
Williamsburg, PA 16693

Bucks County
Jean Nick
1935 Gallows Hill Road
Kintnersville, PA 18930

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

Fulton County
Cass Peterson & Ward Sinclair
Rt 1, Box 765
Warfordsburg, PA 17267

Huntingdon County
James Pingry & Pam Kavanaugh
RD 1, Box 232
Huntingdon, PA 16652

Juniata County
Edgar Rits
RR 1, Box 87
Honey Grove, PA 17035

Lawrence County
Ron Gargasz
RD 2
Volant, PA 16156

Lebanon County
Dennis Kaufman
100 Village Drive
Lebanon, PA 17042

Dale Good
RD 2, Box 112
Newmanstown, PA 17073

Lehigh County
Alan Rex
4310 Best Station Road
Slatington, PA 18080

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

Montour County
Abram & Sherry Ziegler
RD 2, Box 285
Milton, PA 17847

Northumberland County
Alvin Shaffer
HCR 68, Box 67
Dalmatia, PA 17017

Potter County
Kevin Smoker
RD 1
Genesee, PA 16923

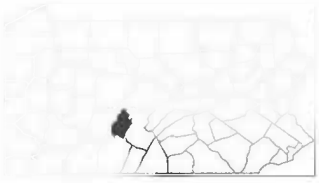
Susquehanna County
Winston & Ginny Wright
RD 4, Box 258
Montrose, PA 18801

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

DAVID & TERRY RICE

BLAIR COUNTY

David and Terry Rice operate a 50-cow dairy farm on 126 acres in the Clover Creek watershed a few miles south of Williamsburg in Blair County. They are active in the Martinsburg Mennonite Church and are members of the Pennsylvania Holstein Association, the Pennsylvania Farm Bureau and the Blair-Bedford Crop Management Association. Dave and Terry were recently honored as Outstanding Young Cooperators by the Pennmarva Federation of Cooperatives.



GRAZING AS A SUPPLEMENT TO TMR IN A DAIRY OPERATION

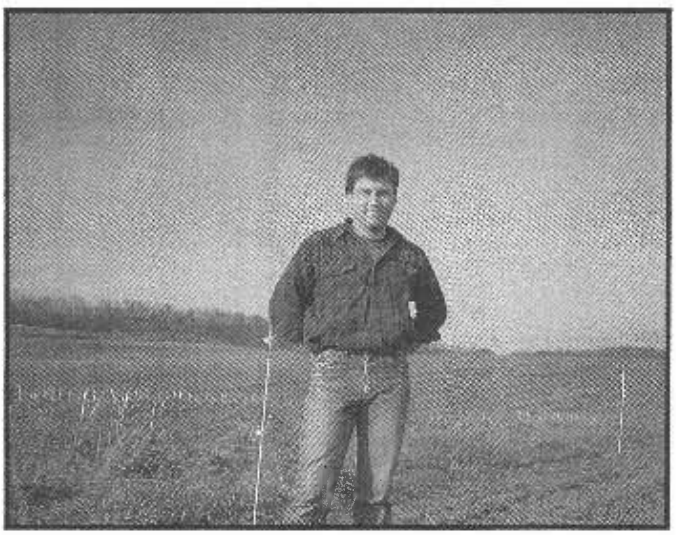
DEMONSTRATION

For this demonstration, Dave pursued his interest in rotational grazing. In 1992, he set aside 14 acres in grass and turned out the cows. The next spring, Dave began an intensified program of grazing management by dividing the pasture into seven small and three large paddocks. The cows were rotated through the paddock system during the 1993 growing season.

Dave kept track of how the use of pasture forages by the dairy cows reduced TMR costs throughout the summer. With a goal of maintaining a 19,000 to 20,000 pound rolling herd average, the TMR mix was adjusted depending on the quality of the pastures.

The summer of 1993 was not one of the best for pasture regrowth, and Dave found that he was forced to keep his TMR supplements high to support milk production. With the flush of spring grass, TMR costs for each cow went down significantly to $3-$4 per cwt of milk production. But due to hot, dry weather, costs climbed to nearly $7 per cwt by the beginning of July. Costs dropped to approximately $6 per cwt by August, when pasture regrowth allowed re-entry into the paddocks.

Because his TMR program is computerized, he was able to keep very accurate records of daily feed consumption:



RESULTS

Date	Cows	Milk Cwt.	Silage	Haylage	Corn	32%	Cotton	Hay	Cost Cwt.	Income
Apr 24-30	42	26.47	18.00	11.42	38.63	39.62	14.21	5.00	$ 4.79	$ 192.83
May 01-15	42	25.29	12.83	8.12	37.3	27.53	12.16	4.13	$ 4.03	$ 203.18
May 16-31	45	25.55	13.23	8.38	40.31	29.21	11.84	4.00	$ 4.19	$ 201.37
Jun 01-15	48	26.21	23.20	15.41	10.34	5.96	4	3	$6.12	$168.36
Jun 16-30	48	26.89	24	25.3	9.43	6.8	4	3.8	$6.36	$166.11
Jul 01-15	46	26.49	24	26	9.67	6.64	4	4	$6.42	$162.69
Jul 16-31	46	28.08	24	27.09	10	6.5	4	4	$5.99	$183.74
Aug 01-15	49	27.43	24	29.5	10	6.5	4	4	$5.44	$210.60
Aug 16-31	45	25.37	24	19.52	11.52	5.16	4	4	$4.97	$206.69
Sep 01-15	46	26.65	24	18.65	11.57	5	4	4	$4.92	$218.95
Sep 16-30	48	27.28	27.96	20.21	11.58	5	4	4	$5.25	$214.94
Oct 01-15	57	29.01	32.5	20.8	11.4	5.2	4	3.93	$6.06	$204.79
Oct 16-31	56	29.66	32.5	13	10.1	6.5	4	3.5	$6.06	$209.28
Nov 01-15	58	29.66	32.5	13	8.9	6.5	4	3.5	$6.03	$210.27

Dave also assessed the cost and set up time required for the different fencing systems he used in the project. Exterior fencing was two-strand high-tensile wire. Interior fences and paddock subdivisions were set up using polywire.

Water was provided to the cows by a fast-flowing creek that runs across the pasture. They had access to the creek by alleyways set up from each paddock. This proved to be a bit muddy early in the year, but by July, two stone crossings were installed with the help of ACP cost-share funds.

Dave's ultimate goal is to establish 17 or more paddocks in the fields that surround the farmstead. Several areas have recently been seeded but not yet put into full use. Several more may be frost-seeded this spring to provide a better mix of grasses and legumes.

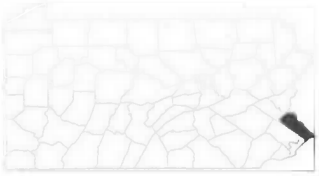
COMMENTS

"We had a very positive experience with grazing during the season even though we had an extremely wet spring. The majority of our pasture was inundated with water for most of April. By May, we got our pasture program in high gear, and through June the cows thrived on the grass.

"Our experience this summer was enough to show us that we could make milk on pasture, with a little TMR mix, and save a lot of money. We could have saved even more money as I look back by pasturing more of our hayfields. Our largest expense every year is feed, and any savings we make by pasturing means more net income at the end of the year.

"We are going to visit other graziers this winter and take a hard look at going to all grass on our farm for 1994."

JEAN NICK
BUCKS COUNTY



A COMPARISON OF MULCH TYPES FOR WEED CONTROL IN RASPBERRIES

Jean Nick is a small-scale, organic raspberry grower in Bucks County. Nick's demonstration provides a two-year look at a new plantation of four different raspberry cultivars. Next year's results will evaluate yield, taste, and profitability. This year Jean looked at weed control in the establishment phase.

DEMONSTRATION

Jean compared the cost-benefit ratio of conventional straw mulch vs. woven landscape fabric covered with straw mulch for four raspberry cultivars: "Schonemann," "Honey Queen," "Golden Harvest," and "Autmun Bliss."

Prior to the trial, she felt that woven landscape fabric might greatly reduce the time-consuming and expensive hand-weeding and suckering that is required to grow raspberries without synthetic herbicides. Jean felt that using mulch for weed control could prove to be a very attractive technique for growers interested in producing high-value organic raspberries at a reasonable cost.

In spring 1993, Jean planted two 75-foot rows of each cultivar using tissue culture plants. One row of each cultivar was mulched with straw only (control) and the other with straw over woven landscape fabric (trial).

PRELIMINARY RESULTS

In 1993, Jean found that the rows with straw only took longer to weed than the rows with straw and landscape fabric (eight hours vs. four hours over the season). The time savings made up for the time spent at the beginning of the season installing the landscape fabric.

1993 cost sheet:

ITEM	TRIAL ROWS		CONTROL ROWS		TOTAL	
	Cost	Labor	Cost	Labor	Cost	Labor
Plowing	12.50		12.50		25.00	
Raking/Bed building		16 hrs		16 hrs		32 hrs
Fertilizers						
400# Alfalfa meal	25.44		25.44		50.88	
50# Kelp meal	25.75		25.75		51.50	
10# Greensand	3.69		3.69		7.38	
Spreading		2 hrs		2 hrs		4 hrs
Drip system	70.00	4 hrs	70.00	4 hrs	140.00	8 hrs
Plants/planting	199.50	5 hrs	199.50	5 hrs	399.00	10 hrs
Weed barrier						
Fabric	120.00		-0-		120.00	
Staples	22.00		-0-		22.00	
Applying		4 hrs				4 hrs
Straw (40 bales)	30.00	8 hrs	30.00	8 hrs	60.00	16 hrs
Grass seed	25.00	5 hrs	25.00	5 hrs	50.00	10 hrs
Weeding (3x)		4 hrs		8 hrs		12 hrs
Mowing Walkways (4x)		3 hrs		3 hrs		6 hrs
Total 1993	533.88	51 hrs	391.88	51 hrs	925.76	102 hrs

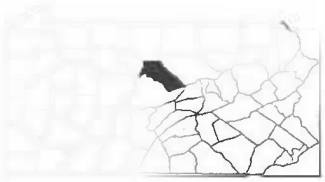
COMMENTS

In the establishment year, the trial rows cost 36 percent ($142.00) more in materials than the control rows, but took the same number of labor hours. In 1994, Jean will be purchasing trellises, which will reduce the percentage difference in cost of establishment.

CHARLES DOTTERER

DOTTERER FAMILY FARMS

CLINTON COUNTY



Charles Dotterer and his family operate a commercial beef feedlot situated on 1,000 acres of gently rolling crop land in southeastern Clinton County. Dotterer Farms raises over 1,500 head of beef and produces corn, soybeans and barley using a no-till cropping system.

Charles has been a long-time supporter of conservation practices and is the chair of the Clinton County Conservation District. He also finds time to be active in the local chapter of Pennsylvania Farm Bureau and is an accomplished vocalist for the United Church of Christ.

"This was a difficult year to attempt such comparisons. Even with all the data we collected, the extreme variability in weather conditions made it hard to hang your hat on anything firm."

REDUCTION OF STARTER FERTILIZER IN CORN

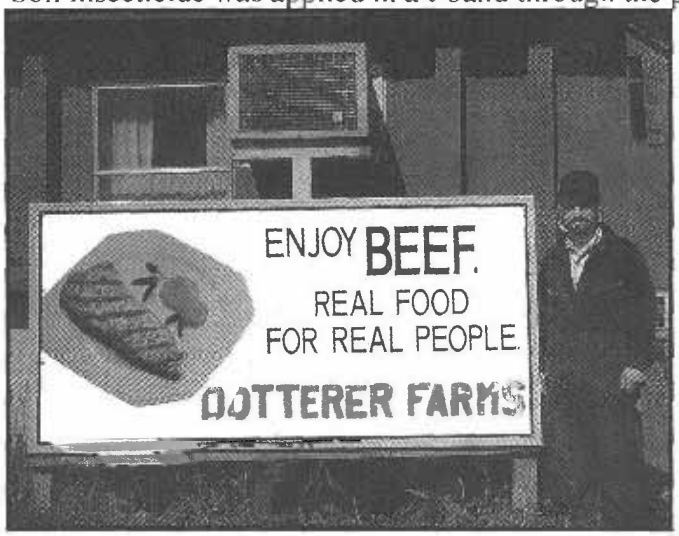
SITE INFORMATION

Rotation: continuous corn
Previous crop: corn silage
Yield goal for 1993: 27 tons/ac
1992 yield: 20 tons/ac
Soil type: Hagerstown
Soil test: Ph- 6.2, OM%- 2.9, P- 343#/ac, K- 504 #/ac, CEC- 10
Hybrid: Doeblers 66xp

DEMONSTRATION

The demonstration was laid out on approximately four acres of a 5.5-acre field. Space did not allow the replication of treatments on this plot. Field received 12-15 tons cattle manure annually in either a fall or spring application for the last 10 years. Manure tests by A&L Labs in May 1993 showed an analysis of 82.6% moisture, 10. 8#/ton N, 7.1#/ton P205 and 6.5#/ton K20.

Spring manure applications were done on 5/19/93. Soil nitrate samples were taken from each treatment on 6/20/93. Sidedressing was done on 6/28 with a 30% nitrogen solution. Primary weed control was pre-emerge, with one post-emerge treatment used for broadleaf escapes. Soil insecticide was applied in a t-band through the planter.



RESULTS

Treatment #	Soil Nitrate PPM	Tons Manure applied/ est. N available*	Sidedress N applied/#/acre	Total N est: #/acre	Silage Yield in Tons (55% moist.)
1	31.1	(Fall)13.5/69#	-0-	69#	12.01
2	21	(Fall) 13.5/69#	100#	169#	12.03
3	29.3	(Fall) 13.5/69#	60#	129#	11.90
4	42.2	(SPR) 14.5/71#	-0-	71#	13.81
5	37.2	(SPR) 16/75#	60#	135#	14.11
6	26.4	-0-	125#	125#	12.31
7	28.1	-0-	60#	60#	11.46
8	24.3	-0-	-0-	-0-	11.89
9	36.1	(SPR) 15.8/74#	100#	174#	14.59
10	28.6	-0-	100#	100#	11.15
11	23.7	-0-	100# + starter (10#)	110#	11.63

*Values for available N from manure calculated from table 21 of the 1993-94 Penn State Agronomy Guide.

Treatment #	Cost of Labor & inputs/acre	Cost N/acre	Total Cost/acre	Harvest Value of crop/acre*	Net return/acre
1	$148.31	$36.13	$184.44	$264.21	$79.77
2	$148.31	$67.13	$215.44	$264.63	$49.20
3	$148.31	$57.13	$205.44	$261.88	$56.45
4	$148.31	$37.88	$186.19	$303.93	$117.74
5	$148.31	$61.50	$209.81	$310.44	$100.63
6	$148.31	$37.25	$185.56	$270.72	$85.16
7	$148.31	$21.00	$169.31	$252.21	$82.90
8	$148.31	-0-	$148.31	$261.64	$113.33
9	$148.31	$71.15	$219.46	$320.96	$101.50
10	$148.31	$31.00	$179.31	$245.22	$65.91
11	$156.47	$31.00	$187.47	$255.75	$68.28

* Harvest value of crop calculated at $22/ton.

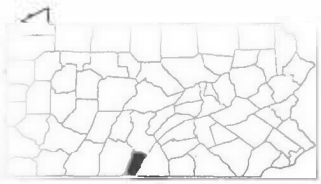
COMMENTS

"The primary limiting factor in 1993 was lack of rain. Rainfall from May 19 to mid-August was only 3.75 inches. Due to the dryness, the corn simply could not make use of the inputs provided.

"We tried soil nitrate tests to explore their usefulness in estimating nitrogen carry over from manure applications. Although they read high, if the N was there, dry conditions probably made it unavailable. Nitrate tests also conflicted with Penn State worksheets for estimating N contributions from cattle manure.

"There appears to have been a positive yield response in the plots receiving spring manure applications, however, due to the dryness, this may have been due more to the mulching effect of the manure than an actual nitrogen contribution."

CASS PETERSON & WARD SINCLAIR
FLICKERVILLE MOUNTAIN FARM & GROUNDHOG RANCH
FULTON COUNTY



ALTERNATIVES TO CONTROL EARLY BLIGHT IN MARKET TOMATOES

In 1992, Cass Peterson and Ward Sinclair conducted a demonstration to determine the effectiveness of several compounds approved for use in organic production against alternaria infection (early blight) in tomatoes. (See 1992 PASA On-Farm Demonstration Book.) "We found that a weak solution of hydrogen peroxide, applied weekly as a preventative measure, was somewhat effective in retarding blight infection, resulting in significantly increased yields of marketable tomatoes."

In 1993, they designed another demonstration to see if stronger solutions of hydrogen peroxide would be more effective in arresting blight.

DEMONSTRATION

The demonstration plot was planted on May 21. Four cultivars that have in the past shown some resistance to blight were chosen: Park's Whopper, Thessaloniki, Tangerine and Pineapple. The first is a hybrid tomato, the other three are open-pollinated "heirloom" tomatoes.

The tomatoes were planted in open ground and overseeded with a rye/clover blend to provide a living mulch. Trellising was done by the stake-and-weave method, starting when the plants were approximately 15 inches tall. The plants were grown without irrigation.

Each demonstration row contained 180 plants, which were divided into four sections for spraying. Section 1 was sprayed with one solution of one-half cup of 35 percent hydrogen peroxide solution to a gallon of water. Section 2 was sprayed with one cup of 35 percent hydrogen peroxide solution to one gallon of water. Both were considerably stronger solutions than the one-tablespoon-per-gallon solution used in 1992.

Section 3 was sprayed with copper sulfate according to label directions at the first sign of blight. Section 4 was to be left unsprayed.

"We also altered the spray schedule from 1992 after reading research reports that found blight infection to be weather-dependent — that is, infection is most likely to occur immediately after a rain or during humid weather. Instead of weekly preventative sprays, which are difficult to keep up in the busy growing season, we chose to spray during high-risk periods — after a significant rain or during extended periods of humid weather."

As it turned out, this decision greatly reduced the number of sprays. Sections 1 and 2 were sprayed only four times — on June 9, June 29, July 27 and Sept. 1 From June 30 to July 26, the farm received only .3 inch of rain. However, because of various crises at the farm, a critical spray at the end of the first week of August was missed, when a heavy rain was followed by a week of hot, humid weather.

RESULTS

Blight symptoms showed up the third week of August, and within a week all sections were severely infected. The Sept. 1 treatment (hydrogen peroxide on Sections 1 and 2; copper sulfate on Section 3) had little effect in arresting the disease. By mid-September, the yield of marketable fruit from all sections was nil.

PROJECT COMMENTS

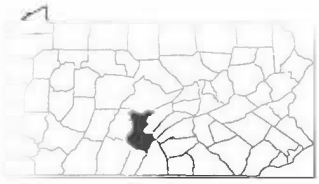
"In hindsight, we wish we had designed the demonstration to include one plot getting a preventative spray every seven to 10 days, regardless of weather conditions. Missing the early August spray also undoubtedly affected the results of this demonstration.

"However, heat and drought, rather than blight, had the biggest effect on tomato yield in 1993. Even during late July and early August, when the plants appeared blight-free, the harvest of marketable fruit was down by about 75 percent.

"Although the hydrogen peroxide-treated plots appeared to resist the onset of blight better than the unsprayed plots, the difference was a matter of a couple of days. When blight symptoms did appear, the sprayed plants collapsed just a quickly as the unsprayed plants.

"We found no evidence that the hydrogen peroxide spray caused any damage to tomato plants. One of our concerns was that the spray solutions — 8 and 16 times stronger than used in 1992 — might have a phytotoxic effect."

JAMES PINGRY & PAM KAVANAUGH HEMMABÄST FARM
HUNTINGDON COUNTY



James Pingry and Pam Kavanaugh have operated Hemmäbast Farm as a small diversified farm for the past 10 years. Starting out with help from the Pennsylvania State University's Small Scale Agriculture Program, they began with pick-your-own organic strawberries and hone-use livestock. By 1990 they were wholesaling strawberries and vegetables to the Tuscarora Organic Growers (TOG) Cooperative and selling at the Huntingdon Farmers' Market. In 1991, Hemmabast Farm stopped wholesaling and became a community supported farm, selling shares of their annual produce to local subscribers. In addition to farming, both James and Pam are full-time teachers at a local private boarding school.

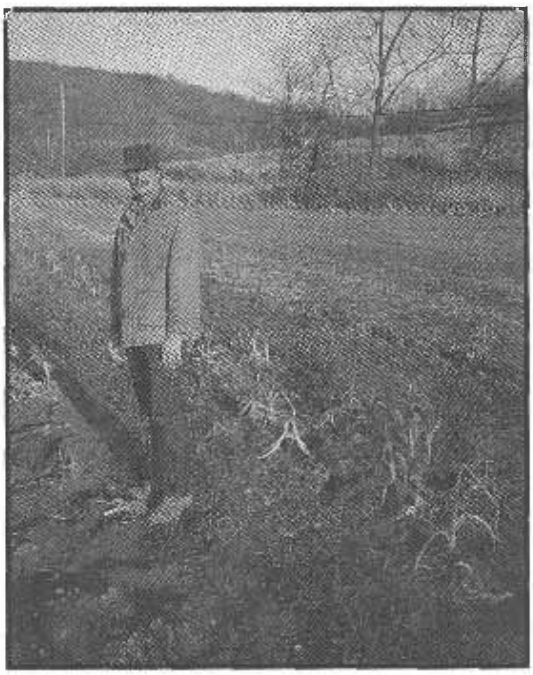
BENEFICIAL NEMATODES TO CONTROL ONION MAGGOTS IN LEEKS

DEMONSTRATION

James Pingry has been planting 3,000-5,000 leeks annually since 1991. The leek (Allium porrum) is a member of the onion family that is less sensitive to photoperiod (the number of sunlight hours) and continues to grow well into the fall. Although leeks do not store as well as onions, as a specialty crop, they often command a high price. In most organic markets and co-ops the demand for leeks is strong.

In the first two years of growing the crop, James lost a significant number of potentially marketable leeks to the *onion fly maggot*. This pest burrows into the growing stalk, leaving a brown spot and a hole that makes the plant unsalable.

James had heard that beneficial nematodes had been used to control onion maggot fly in other Allium related crops. Nematodes are microscopic roundworms that live in all soils and aquatic environments. Some nematode species are pests and cause crop damage, but others are beneficial and infect crop pests like the onion fly maggot. "I was amazed to find out that nematodes are purchased by the millions! The recommended dosage per plant was approximately 13,000 nematodes."



James learned that in order for nematodes to survive in the soil once they have been applied, the soil must be kept moist and be disturbed as little as possible. This presented some problems. His primary method of weed control was cultivation, and since leeks are not an irrigated crop, it would be difficult to maintain adequate soil moisture. To keep nematode populations happy, James decided to use mulching and hilling to conserve soil moisture and limit soil disturbance.

Because of wet conditions at planting time and extremely dry weather later in the season, James was not able to apply the nematodes until August 5. Until application, the nematodes were kept alive in an aerated jug inside a refrigerator with an optimum

temperature of 38 degrees F. Using a two-gallon sprayer, a solution containing the nematodes was misted over the plants. The rows were promptly hilled and mulched after spraying.

The leek crop was planted into two separate fields. In one field, half of the crop received a nematode application; the other half did not. In the second field, three-quarters of the leeks were treated; one quarter was not. The harvest of marketable leeks began in September, and continued weekly through mid-November. Precise records were kept as to the number of maggot- damaged plants in both treatments.

RESULTS

Total planted leeks 3175
Total harvested leeks 2004

Treated ..1490	Damaged ...147	Net ..1343	Yield...90%
Untreated.514	Damaged 87	Net 427	Yield...83%

Average price received per leek .....$ 2/bunch of 3-4 leeks

COMMENTS

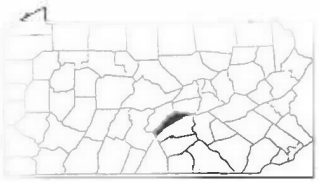
"The 7 percent savings on the treated crop was less than I had hoped. On a larger planting, the savings would have paid for the cost of the nematodes, making their application a more cost-effective effort. I feel that under different weather and growing conditions, I would have seen better results.

"Ideally, the application of nematodes should be made in three stages. One quarter of the dosage should be applied in the flats two days before transplanting, giving the nematodes time to migrate onto the roots. Another quarter should be applied to the soil immediately after transplanting, and then the last half of the batch should be applied later on, just before hilling. Adequate soil moisture should be maintained by irrigation during dry spells. Unfortunately for this demonstration, this precise information was not available to me until the leeks had already been planted, which may also have negatively affected the results.

"Overall, this method adds to the labor input of the crop, but if conditions are optimal, it would appear to justify the extra labor. Controlling weeds poses a problem with this method also, but by starting with a very clean bed, the nematodes could probably coexist with the weeds until hilling time, avoiding soil disruption."

James feels that more experimentation needs to be done, but that the use of beneficial nematodes could play an important role for farmers that grow crops that are susceptible to root maggot pests. In addition to onion maggots, these same nematodes prey on a variety of pest larvae, from cucumber and flea beetles to cutworms.

EDGAR RITS
TUSCARORA FARM
JUNIATA COUNTY



COMPARISON OF BLACK AND WHITE PVC PIPE FOR PASTURE WATERING SYSTEMS

Ed and Lorraine Rits own and operate a 200-acre livestock and grain farm near Honey Grove. The farm has been in the Heckman (Rits) family since 1887. Crops raised in 1993 were five acres of rye and 80 acres in hay and pasture.

After selling their dairy herd in 1987, the Ritses worked to develop a debt-free beef operation with all cows spring calving under a management intensive grazing system. They expect to increase their herd from 18 to 30 cows by 1995. Calves will be grass fed and sold as freezer beef the following fall.

Ed, formerly a professional soil conservationist, is also self-employed as an agricultural consultant. He serves as a director and secretary of his local Crop Management Association, is a state CMA director, and co-chairs PASA's On-Farm Activities committee.

Since 1976, Ed has profitably used a wide array of sustainable production techniques and resources, including: crop rotations, cover crops (rye, hairy vetch, red clover, buckwheat), alternative crops (rye, lupin beans, buckwheat), minimum-till, no-till, animal manures, composted manures, Integrated Pest Management, non-mechanical land clearing, spinner seeding, intensive rotational grazing and re-establishment of grass/legumes on cropland without seeding.

"In addition to my personal desire to use on-farm resources wisely and to reduce purchased inputs, I want to demonstrate how a small farm livestock-based enterprise can be profitable and environmentally sound and provide consumers a drug free, low-fat meat product," Ed says.

In developing a farming operation using "new" sustainable farming methods, farmers are faced with "new" choices of materials to meet farm operation needs. One such choice on the Rits farm was to put water in each paddock. This required use of flexible PVC pipe to get water from its source to each paddock.

"In 1992, several companies came on the market with a new white PVC water pipe that they claimed was superior to the traditional black pipe used in grazing watering systems. The idea was that the white pipe would reflect more heat-making the water cooler for the cattle, encouraging them to drink more, which is particularly important for animals on pasture.

"The cost of the white pipe ranged anywhere from six to 10 cents per foot more than the black pipe, which can add up it you have significant amount of pipe to run. I was interested to see if the white pipe would actually increase water consumption and be cost-effective."

DEMONSTRATION

Eighteen cow/calf pairs and one bull were grazed on a 10-acre pasture divided into 15 paddocks. Two water lines, one black and

one white, with quick couplers were laid on the surface of the ground and attached to a water meter. Cattle were moved at 7 - 8 a.m. each day to a new paddock. Air and water temperatures and water consumption were recorded at 8 a.m., 12 noon, 4 p.m. and 8 p.m. in the month of July. A gray-colored mini-tub was moved each morning to the new paddock.

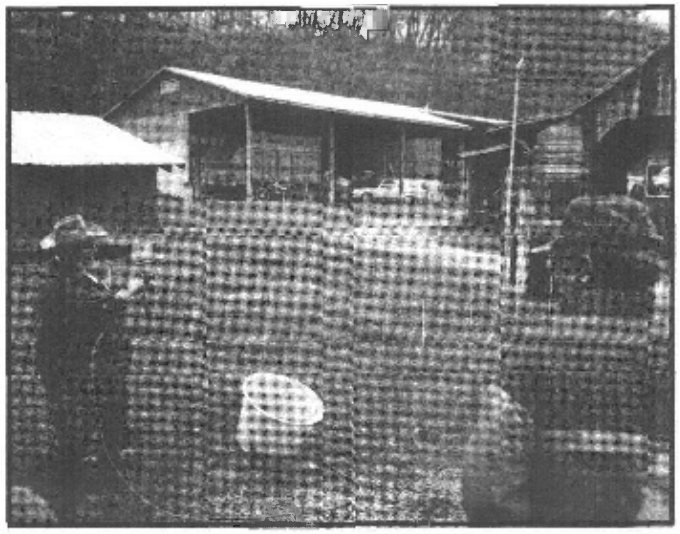
RESULTS

1. At 8 a.m., the water temperatures in the black pipe, white pipe and the tub were the same as the air temperature;
2. At 8 p.m., all water temperatures had generally returned to the air temperature;
3. At 12 noon and 4 p.m., the water temperature in the tub was generally 15 degrees F lower than the air temperature and 10 degrees F lower than the pipe supplying water to the tub;
   a) when white pipe provided water to the tub, it was 20-25 degrees F lower than the water in the black pipe;
   b) when black pipe provided water to the tub, it was 10-15 degrees F lower than the water in the white pipe;
4. Water consumption, based on a week of hazy, hot, humid days with no rain, was as follows:

   Black pipe — 336 gallons/day = 17.7 gallons/animal
   White pipe — 339 gallons/day = 17.8 gallons/animal
   Black pipe night consumption = 22 gallons: 6.5% of daily consumption
   White pipe night consumption = 48 gallons: 14% of daily consumption
   New paddock at night (black pipe) = 25 gallons: 7% of daily consumption
   On a rainy day, water consumption was about 100 gallons per day = 6 gallons/animal.

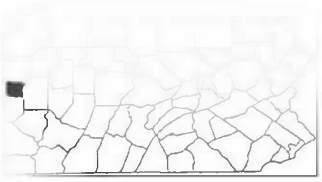
CONCLUSION

At the Rits Farm, there was no significant difference in the amount of water consumed by a beef/cow herd when water is provided by black or white pipe during July 1993. It would not appear that the extra cost involved in using white pipe is justified based on increasing water consumption by beef cattle.



RON GARGASZ
GARGASZ FARMS
LAWRENCE COUNTY

Ron Gargasz grows small grains, soybeans, forages, and edible beans and raises beef on over 200 acres near Volant. Eleven years ago, Ron switched from conventional farming methods to become a certified organic farm. He manages the farm in a holistic way, using an integrated systems approach that balances the needs of the farmer with the biological potential of the farm.



A HOLISTIC APPROACH: CASE STUDY OF A DIVERSIFIED ORGANIC FARM

DEMONSTRATION

The various components of Gargasz Farms and how they fit together are described below.

ROTATION: Edible beans, barley, triticale, buckwheat and soybeans are rotated with two years of alfalfa. Ron feels this system is environmentally neutral, i.e., the nutrient requirements of these crops vs. the nutirents supplied by the rotation porduce no net-loss in soil fertility. No corn is grown because of its heavy nutrient requirements and susceptability to drought. Fall seeded small grains take better advatage of winter and early spring moisture, producing grain and straw for the livestock. Yields are consistently equal to or better than the county average.

TILLAGE: Primary tillage is with a chisel plow or a vibrating tine cultivator. Purpose of tillage is to incorporate crop residues into the top 4" to 6" of soil to build organic matter, improving moisture retention and tilth. As a whole, soils readily absorb water and "spring" under foot. Erosion is not a problem anywhere on the farm.

WEED CONTROL: Pre-emergent weed control is accomplished with a rotary hoe. Post-emergent control is maintained with a rotating tine cultivator. Fall seeded rye and buckwheat are used as cover and smother crops, out-competing weeds.

PEST CONTROL: Pest control is accomplished with tillage and rotations.

INTER-CROPPING: Soybeans follow buckwheat in the rotation. Buckwheat will volunteer into the soybeans after the last cultivation, providing weed control and a companion crop at harvest. Crops are separated and cleaned on-farm.

DOUBLE CROPPING: Spring barley is harvested as high moisture silage. The field is then replanted to barley and the process repeated. In other fields, buckwheat is planted as a winter cover after the harvest of small grains.

ON-FARM SEED PRODUCTION: All crops are grown from seed collected on the farm. This practice has been followed for 20 years without a reduction in yield.

SILAGE PRODUCTION: High moisture, round bales are bagged to provide high quality winter feed.

CERTIFIED ORGANIC BEEF HERD: A cow/calf herd is maintained for certified organic beef, for the production of manure and to recycle surplus crops. Diet consists of silage and small grains produced on the farm.

NUTRIENT MANAGEMENT: Nitrogen for crop production is provided by legumes and composted manures.

MARKETING: The farm uses a diversified marketing system. Cash crops, edible beans and grains are grown for local markets and known prices. Cattle are sold as freezer beef by the half and quarter for a 20 to 30 percent premium. Other crops are direct-marketed to consumer and wholesale markets, providing access to high prices.

SUMMARY

Over the last eleven years since switching to a sustainable, organic production system, Ron has eliminated the use of chemical pesticides and purchased fertilizers. He has greatly improved his management and marketing. His increased use of on-farm inputs, such as tillage systems, manures, legumes, residues, double cropping, etc. has improved his basic soil resources and his "bottom line." Crop yields are equal or better than county averages. The Ron Gargasz Farm proves organic farming can be both practical and profitable *if* a farmer manages resources well and understands basic agronomic relationships *and* has the patience and understanding to work with nature to allow the system to work.

COMMENTS

"The summer of 1993 was extremely dry in our area, with practically no rain during the growing season. Crop yields were still good, however, which I like to think speaks well of my integrated, organic management plan.

"I feel that this farm demo exemplifies whole farm system considerations - since my three farms represent diverse soil types and textures- each predicating the crop rotations employed and the management practices utilized, all in concert with the increasing market demand for certified organic products."

DALE GOOD
LEBANON COUNTY

Dale Good crops 450 acres for his 80-cow dairy herd in southern Lebanon County near Newmanstown. Good is experimenting with a variety of sustainable farming techniques with the goal of eventually eliminating herbicide use and building soil tilth. A member of Atlantic Dairy Cooperative, Dale is working to make his operation environmentally sound for the long term.

SITE INFORMATION

- Previous crop: Corn (170 bu.)
- 1993 crop planted: CFS Waxy Corn #6359
- Yield Goal for 1993: 150 bu.

COMPARISON OF STARTER FERTILIZERS AND CALCIUM APPLICATIONS IN WAXY CORN

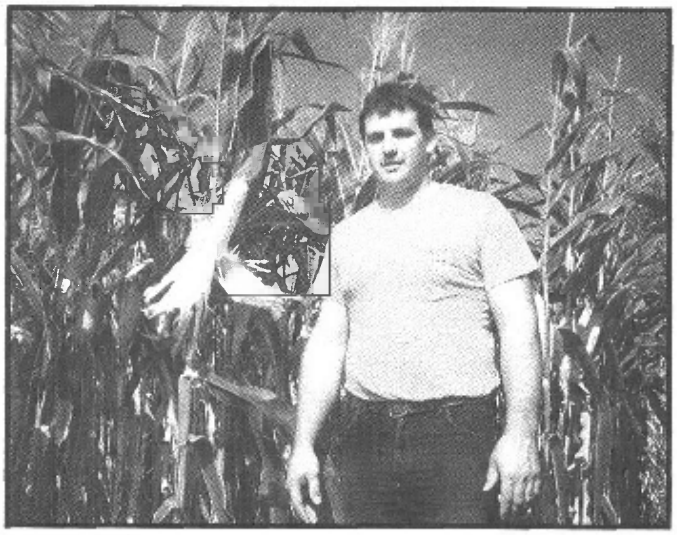
DEMONSTRATION

Dale is concerned about the effect that chlorine-based starter fertilizers have on soil health. He is also interested in comparing the effectiveness of lime with a liquid calcium product on corn yields. This demonstration set up a double-replicated plot of six treatments comparing a 13-13-13 dry starter with a 4-8-19 liquid (Nachurs w/ Maxicrop). Each treatment plus a control was replicated with and without liquid calcium (NutriCal).

#6 Dry Starter + Nutri-Cal	#3 Liquid Starter + Nutri-Cal	#2 Nutri-Cal Only
#5 Dry Starter Only	#4 Liquid Starter Only	#1 No Starter No Nutri-Cal

NOTES

- Treatment size = .62 acres, 18 rows each
- Middle six rows of each treatment were harvested for yield checks
- All treatments received 5t/a dry layer manure
- Site Size: 7.5 acres



RESULTS

Planting population: 30,000
Planting Date: May 15, 1993
Harvest Date: October 19, 1993

			YIELD IN BPA AT 15% MOISTURE	
			PLOT A	PLOT B
Treatment #1	-	No Fertilizer + No Nutri-Cal	126.4	123.6
Treatment #2	-	no Fertilizer + Nutri-Cal	128.1	124.5
Treatment #3	-	4 GPA 4-8-19 Liquid Fertilizer + Nutri-Cal	128.2	128.6
Treatment #4	-	4 GPA 4-8-19 Liquid Fertilizer + No Nutri-Cal	119.6	131.6
Treatment #5	-	150 lbs./ac. 13-13-13 Dry Fertilizer + No Nutri-Cal	124.4	128.1
Treatment #6	-	150 lbs./ac. 13-13-13 Dry Fertilizer + Nutri-Cal	126.5	122.2

Liquid Fertilizer is mix of Nachurs and Maxi-Crop.
Nutri-Cal (a liquid calcium organic chelate) applied at 1.5 gallons/acre on June 2, 1993.
All Treatments received 10 lbs./ac. kelp meal.

COMMENTS

"I'm trying to work with environmentally safe products and programs in all aspects of my operation. We don't use any commercial fertilizer except for starter, just poultry manure. With the starter fertilizer, I just felt that the chlorine based material was hurting my soil tilth.

"My goal is to eliminate all herbicides in the future, and I'm experimenting with a variety of cultivation techniques that will allow me to cover all the ground I need to. I use rye on much of the farm and that helps with the weeds. I might try fall oats that will winter kill in the future. I'm also using kelp on my corn, which seems to control insects, and I quit using Furadan. So it's saving me money too.

"I feel better about the direction I'm heading. I don't think my yields are suffering at all. In fact, during the dry years, lately, my corn looks pretty good."

DENNIS KAUFFMAN
LEBANON COUNTY

Dennis Kauffman runs a dairy operation in southern Lebanon County. His goals are to build a strong breeding program and mainatain a high rolling herd average. Dennis is interested in cutting costs and decreasing inputs in order to save money, but would like to maintain or increase production quality and yields. "I just feel that increasing biological activity and soil health is more sustainable and economical, in the long run."

EFFECT OF A FERTILITY ADJUVANT ON ALFALFA YIELD

DEMONSTRATION

This demonstration sought to measure the effect of a plant stimulant (AgriBlend) on alfalfa yields. The material is foliar applied, sprayed on the regrowth of each cutting. Three cuttings received an application in this demonstration.

SITE INFORMATION

- Previous crop: alfalfa (stand established in 1991)
- Yield Goal for 1993: 6 ton/a.
- Site Size: 6 acres
- Soil type: Hagerstown silt loam
- Soil Test: pH - 6.6 OM% - 2.8 P - 167#/a K - 182#/a CEC

MANAGEMENT AND INPUTS

- Weed control: Gramoxone extra @ 12 oz. for control of grasses
- AgriBlend Foliar applied at 5-6" @ 12 oz./acre
- 150 lbs. of potassium sulfate and 2 lbs. Boron applied to soil between first and second cut only - Cost = $45 / acre
- AgriBlend Foliar applied to 10-12" regrowth of second cutting. No further fertilizer applied.
- AgriBlend Foliar applied to third crop at 4-6" regrowth. No insecticide was applied.

RESULTS

Visual differences were not obvious on the first and second cuttings. However, the third cutting showed a marked contrast between the treated and untreated plots. The alfalfa in the treated plot was 3-6 inches taller and had larger leaves. The leaf color was pale green compared to the blue-green on the untreated plot. The untreated plot was lodged at third cutting and had fewer whole stems than the treated.

Tissue tests were taken to compare feed values on the third cutting. Test results showed slightly higher levels in the treated plot in most categories, but results were not statistically significant.

TISSUE ANALYSIS
BALED ALFALFA HAY
Treated and Untreated

Date Analyzed: June 3, 1993

	UNTREATED AS SAMPLED	TREATED AS SAMPLED	UNTREATED DRY MATTER	TREATED DRY MATTER
Moisture, %	18.3	16.4		
Dry Matter, %	81.7	83.6		
Crude Protein, %	16.7	16.6	20.4	19.9
Soluble Protein, %	23.00	23.00	23.00	23.00
Undegradable Protein, %	30.00	32.00	30.00	32.00
Digestible Protein, %	10.8	10.8	13.2	12.9
Acid Det. Fiber, %	27.2	26.8	33.3	32.1
Neut. Det. Fiber, %	35.2	34.4	43.1	41.0
TDN, %	est. 51	est. 54	62	64
ENE, %, Therms/Cwt	est. 43	est. 46	53	55
NE/Lact, MCAL/lb	est. 0.52	est. 0.55	0.64	0.66
RFV	136	145		

COMMENTS

"I got involved in this demonstration because I wanted to answer a question I had on my farm. I also don't see us getting help on these kinds of issues in Pennsylvania, from a research standpoint."

ALAN REX
LEHIGH COUNTY

USING LEGUME COVER CROPS AS A NITROGEN SOURCE FOR CASH GRAINS

Alan grows corn, soybeans, oats, wheat, spelts and hay on 170 acres of certified organic cropland. The farm has been managed organically for the past 30 years.

Since there is not enough manure produced on the farm to meet all fertility needs, purchased fertilizers are used. In an effort to find legumes that could supply supplemental nitrogen, provide soil cover and build organic matter, Alan compared red clover and alsike clover interseeded into a newly planted oat crop. He reasoned that if the oats could be harvested without causing significant damage to the legume cover, the alsike and red clovers could fix a great deal of plow-down nitrogen for the following wheat crop.

DEMONSTRATION

Clovers were seeded April 16, two days after the oats. Plots were established in fields with high shale and clay contents. The oats were harvested on July 24.

On October 6, just before the fields were to be plowed in preparation for planting fall wheat, the plots were cut and weighed. Tissue samples were also sent to a lab for analysis.

RESULTS

Both alsike and red clovers produced a significant amount of biomass and kept down weeds without chemical control during the summer fallow period. Red clover seemed to produce more biomass and fixed more nitrogen, but seed costs were higher.

POUNDS (DRY WEIGHT) OF BIOMASS PRODUCED IN OAT STRIPS OVERSEEDED WITH CLOVERS

	lbs. clover/ac.	lbs. weeds/ac.
Red clover		
on shale	1581	464
on clay	1226	546
Alsike		
on shale	1035	627
on clay	1089	438
No clover		
on shale		1143
on clay		1363

BIOMASS (DRYMASS), NITROGEN CONTENT, AND ABOVE-GROUND NITROGEN SUPPLIED BY CLOVERS.

	lbs. biomass/ac.	%N	lbs. N/ac.	Seeding rate	Seed cost/ac.
Red clover					
on shale	1581	3.16	50	20 lbs./ac.*	29.60
on clay	1226	3.23	40	15 lbs./ac.	22.20
Alsike					
on shale	1025	3.09	32	15 lbs./ac.*	11.40
on clay	1089	3.18	35	10 lbs./ac.	7.60

*Calibration problems on seeder resulted in overapplication.

COMMENTS

"In this application, where the clover is only grown from April to October and not allowed to overwinter, the alsike seems to be the best choice. However, this was an unusual year with almost no rain in May and very dry conditions in July and August. I plan to continue this comparison next year in another field to see if I get similar results.

"We have also been seeding rye after soybean harvest for plow-down before corn and have been very pleased with results. We also planted hairy vetch in 1992 and plowed it for this year's corn. The yields were very good, and in the future we will be using vetch in our rotation as much as possible."

ANNE & ERIC NORDELL
BEECH GROVE FARM
LYCOMING COUNTY

COVER CROPS AND ROTATIONS FOR SOIL FERTILITY AND WEED CONTROL IN VEGETABLES

Anne and Eric Nordell operate Beech Grove Farm on 90 acres near Trout Run. They employ a highly sophisticated production system, where all functions are integrated to benefit the total operation. The Nordells produce a wide variety of vegetables and herbs, which they sell at retail and wholesale markets. They have been farming organically for 11 years.

Anne and Eric have been active in promoting sustainable agriculture in the Northeast for many years. Eric is a frequent author for a variety of sustainable farming periodicals, and Anne has served on the PASA Board of Directors. They are both in demand as speakers at sustainable agriculture conferences throughout the Northeast.

"At Beech Grove Farm, we have attempted sustainable vegetable production with high-value crops on low-priced land by substituting land for non-renewable off-farm inputs. This has taken the form of a simple two-year rotation alternating between cash crops and fallow lands over 12 one-half acre strips. During the fallow years, two cover crops sandwich a bare fallow midsummer to prevent weeds from going to seed, reducing hand weeding in most crops to just a few hours per season. Diversity and complexity have been added to the system by rotating the types and timing of cash crops, cover crops, tillage and compost applications (see rotation chart in 1992 Project Results).

"Cover crops are the backbone of our farm system, restoring soil structure after cool-season cash crops, such as leafy greens and root crops, which typically return little in the way of organic matter to the land. Cover crops also help preserve soil and moisture on our exposed hilltop site. Although cover crops can be expensive, cover crop seeds are a renewable resource that can be purchased from sustainable field crop farmers."

PROJECT RESULTS — 1993

In 1993, the Nordells repeated many of their 1992 cover crop trials and experimented with several new additions (berseem clover, mammoth red clover, perennial ryegrass and crimson clover) to get a better handle on which best compliment their long-term vegetable rotation and how they perform under variable weather conditions. The weather provided extreme fluctuations, beginning with an unusually wet and cold spring, followed by a heat wave and dry conditions that ended with seasonable weather in the fall. Approximately two inches of rain fell each week until mid-May, then the precipitation dropped off to two tenths of an inch per week until the end of August.

COMPARISONS OF COVER CROPS PRECEDING EARLY PLANTED CASH CROPS

(Please see the 1992 Project Results for background and details on the objectives, establishment and evaluation of the following trials.)

The field planted to late oats following a delayed fallow and alfalfa plowdowns in the fall of 1992 was the earliest to be worked and planted

this wet spring. The soil surface was, however, noticeably tighter than the fields covercropped in peas and vetch, presumably because there was much less root and top growth to protect the silty soil from the heavy spring rains. However, once the soil warmed up in July, earthworm activity and soil structure was noticeably better in this field than the other early planted fields. Deep rooted crops, like spinach and carrots, grew exceptionally well despite the dry, hot conditions. Shallow rooted onions and lettuce looked nutritionally stressed and yielded poorly by comparison.

The Nordells again noticed a favorable connection between compost applications and the growth of the leguminous sod when repeating the cover crop sequence in 1993. Frost seeded sweet clover plowed down in August had roots 1/4 - 5/8" in diameter where compost had been applied before planting the rye cover crop the previous fall, while the roots of the sweet clover where no compost was applied were only half the size. These observations reinforced for Anne and Eric that a limited supply of compost may go further in improving soil structure by applying the compost before planting leguminous cover crops rather than before the cash crops themselves.

A thick mat of winter-killed field peas required three more drying days than the late oats field before the soil was fit to work. Additionally, the pea residue required two more tillage passes (disc and field cultivator) to prepare the ground for onion sets. Preparing the trashy conditions for direct seeding would have required even more time and tillage. Onion growth was much healthier after the pea cover, and yields were average despite the dry conditions during bulb formation.

With marginal moisture at pea seeding in early August f 1993 and precipitation returning to normal in September and October, this year's trials made 18-24 inches of growth, about halfway between the 1991 and 1992 field pea trials. Peas seeded in early September after a delayed fallow grew only 12 inches tall and did not provide as much ground cover as late oats.

The Nordells again experienced severe maggot problems in vegetables planted after incorporating a live cover crop of hairy vetch. Early seedings of both spinach and carrots had to be replanted, although this was not necessary where these crops were planted at the same time after late oats. Transplants, on the other hand, appeared to enjoy the quickly available nitrogen and phosphorous from the shallowly plowed vetch, but fertility and soil structure did not seem as enduring as after their usual rye/vetch cover crop mix. A vetch seeding in early August of this year made impressive root and top growth much like the sod produced under similarly dry, hot conditions in 1991.

ESTABLISHING LEGUMINOUS SOD IN THE VEGETABLE ROTATION

Sweet clover overseeded into cash crops in 1992 withered back to almost nothing over the winter, so only the roots provided soil protection. (With this in mind, the Nordells returned to

mixing white Dutch clover with the sweet clover in this year's overseedings). The earlier the establishment of sweet clover, the better the fall and winter cover it provided and the earlier and more vigorous the regrowth in the spring of 1993 (making overseedings in June and July seem much more desirable than direct seeding after harvest of early cash crops in August). Once established, sweet clover made good growth despite dry conditions this summer. Packing the seed significantly encouraged rapid establishment in dry conditions. (To that end, the Nordells built a one-row cultipacker to set the seed in the pathways after spinning on the clover).

Given last year's experience with overseeded sweet clover creating "corridors for wildlife" to the vegetable crops, the Nordells have decided the most suitable opportunity for establishing sweet clover in the cash crop rotation may be overseeding early harvested cash crops in early summer. For late harvested cash crops, Anne and Eric found that an August overseeding of perennial ryegrass and crimson clover provided adequate ground cover by October without competing with the crop or attracting wildlife. Earlier overseedings with perennial ryegrass this year proved it is much slower and less reliable to establish under drought conditions than clover. Rye grain in a late August overseeding overwhelmed the crimson clover and interfered with harvesting low growing leaf crops. Crimson clover did not establish well when frost seeded into rye grain this spring.

"While we expected berseem clover, a Mediterranean import, to excel during this summer's heat, we were surprised that it germinated and grew significantly faster than any of the other clovers (sweet, mammoth red, white Dutch and crimson) we frost seeded into rye grain this cold, wet spring. After the second clipping of the rye in early June, the berseem grew 18-24 inches tall by July 12, twice as tall as the other clovers trialed and completely overwhelming the sweet clover and alfalfa experimentally direct seeded with the rye in this field the previous fall. The berseem was clipped at this point and made only 12-16 inches regrowth by fall.

"One drawback may be that the berseem blossomed and set seed for six weeks during this period of regrowth. We won't know until next year if having berseem in the soil seed bank will be a blessing or a curse. After four heavy frosts in a row (below 20 degrees), the berseem was beginning to show signs of dying back on November 15. Our hope is it will live up to its reputation of winter killing in the North, minimizing the need for spring tillage and hopefully reducing the incidence of slugs, grub, flea beetles and other underground bugs we have associated with plowing down live leguminous sods before cash crops in the spring."

COMMENTS

The positive results of this year's trials encouraged Anne and Eric to consider adapting the cash crop rotation to the strengths and weaknesses of the cover crops rather than the other way around. Instead of grouping early planted cash crops by type (root, leaf and flower) as they have done in the past, Anne and Eric are considering differentiating early cash crop fields by planting requirements. "For example, early planted direct seeded crops would follow late oats in the rotation, while early transplants and onion sets would be planted into the high residue conditions following winter killed peas. Short term transplanted crops, like midsummer lettuce, might follow skim plowed hairy vetch. These sequences also seem to prepare the land for the rooting and nutritional requirements of the cash crops in question."

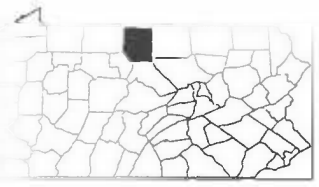
KEVIN SMOKER
SMOKER FARMS
POTTER COUNTY

Kevin operates a dairy farm in partnership with his brother on approximately 1,000 acres in northern Potter County near Genesee. The Smokers raise over 500 acres of crops with nearly 120 acres in hay. Kevin believes in protecting natural resources and has worked with the SCS to develop good conservation practices. He manages manure resources carefully and spreads to most fields on the farm.

DEMONSTRATION

Kevin wanted to find out how much he could save by reducing or eliminating starter fertilizer in corn where soil fertility was adequate due to manure applications.

Six random strips of eight rows each were planted with three different rates of starter fertilizer. The field had good,"but not great" fertility from the manure and was not particularly well drained.



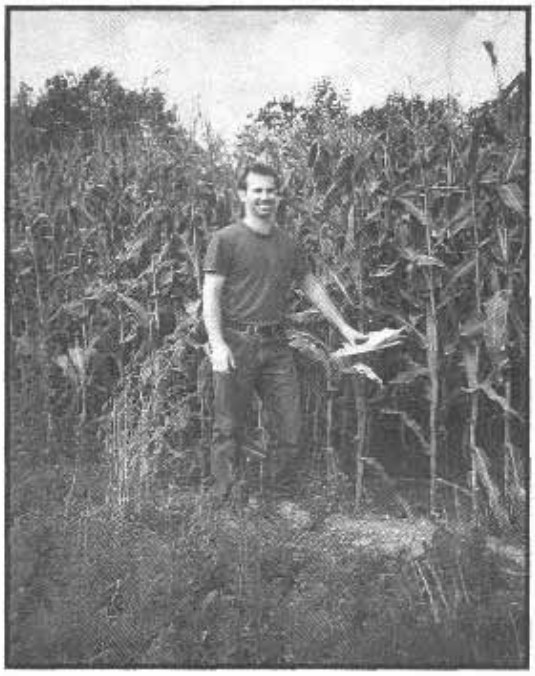
REDUCING STARTER FERTILIZER RATES IN CORN

RESULTS

Rate of Starter Fertilizer	Avg. Yield (15.5%)
210 lb./ac.	102.6 bu./ac.
140 lb./ac.	115.3 bu./ac.
0 lb./ac.	101.3 bu./ac.

The early part of the season was not conducive to corn growth. "Corn just 'sat there' after planting, same throughout the county this year."

On July 15, the strips without starter were definitely behind. Stalks were not as thick or healthy looking, and there was no real difference between the 140 and 210. By September 8, when the yield checks were taken, it was difficult to tell any difference. "There was not much variation between the three rates. It might be that the variation in the field and its soils explains the differences."

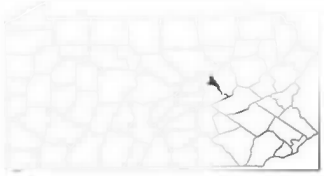


COMMENTS

"I think I may have learned something. I wouldn't change things totally based on one year, but there is not much difference for using no starter.

"I should probably be watching my spreading better and taking more soil tests to know what I need better. A dairy farmer ought to be paying attention to the use he gets out of manure. He might even save some money."

ABRAM & SHERRY ZIEGLER
MONTOUR COUNTY

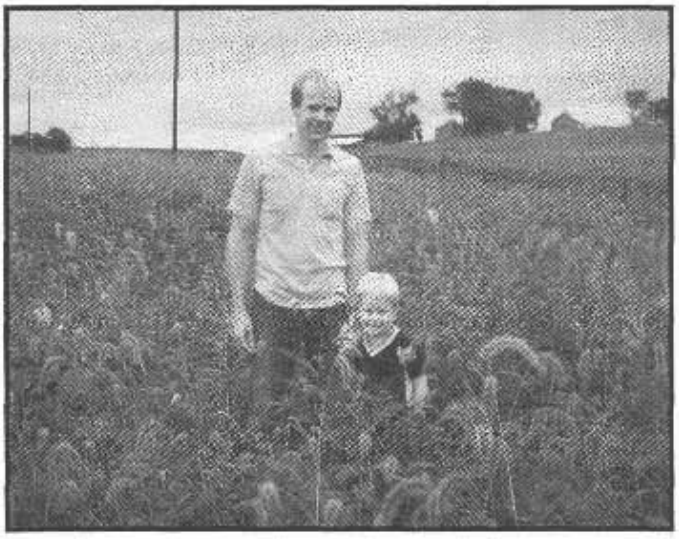


Abram and Sherry Ziegler, along with their five children, farm 300 acres of cash crops and livestock near Milton.

Abram is very interested in networking with other farmers using sustainable field crop techniques and pasturing pigs. Observing field conditions brought on by severe fluctuations in weather over the past several seasons, he became interested in experimenting with cover crops to enhance soil fertility, crop stands and weed control.

"During the spring and summer of 1991, our area was particularly hard hit by drought. While watching our young corn plants wither in mid-June, a marked difference could be seen in fields that had some type of residue or mulch compared to those that had bare soil. I came to the conclusion that somehow we need to build organic matter, at least in the top few inches of our soils."

OVERSEEDING HAIRY VETCH INTO SOYBEANS



Since then, Abram has begun the process of changing his corn-soybean rotation to what he hopes will be a corn-soybean-oats-wheat-clover rotation. However, unless he can find a better cash-producing crop, he may be forced to go back to corn after soybeans with relatively little residue cover. "We have been trying to find a good companion crop to follow soybeans that will give us lots of winter cover, produce high amounts of residue that can be tilled in May just before planting, and produce nitrogen benefits as well."

For 2 or 3 years, Abram has been planting soybeans in 30-inch rows and relying on a minimum-till cultivator and rotary hoe as the primary source of weed control. The challenge for 1993: Could hairy vetch be seeded into full season soybeans during the August planting window? Abram identified two options; 1) aerial seed with an airplane, or 2) broadcasting seed into the standing crop at the last cultivation. He chose to try the latter.

DEMONSTRATION

The plot was planted in May. The previous crop was corn that yielded approximately 130 bu./ac. in 1992. The field, which is fairly level, was limed and plowed in December 1992. Certified, late group III soybeans were planted at a rate of 148,000 seeds/acre. The field was rotary hoed at six and 14 days after planting for early weed control. At first cultivation (V3-V4 stage), the beans were sprayed over the row with a growth regulator at 5 oz/ac. The field was cultivated for the second time on July 20.

The last week of July, Abram rigged up an electric, spin-type seeder and mounted it atop the center of the cultivator frame. After experimenting a bit with the seeding rate and making a shield to keep the seeds from hitting the tractor driver, it was ready for a try.

"Our original plan was to replicate alternating 6-row strips of vetch vs. no vetch across the width of the field. Unfortunately, because the original spreader motor did not work, and we had to replace it with one from an air-seeder, it ran much faster than the original and three seed 20 feet on each side of the tractor. I tried to compensate by leaving wider spaces between the strips but that did not work well. Using this method, we broadcast 25 pounds per acre of vetch during our final cultivation on August 6. We also applied a 3-18-18 foliar fertilizer solution at 3.5 gallons per acre.

RESULTS

"On August 10, God blessed us with 1.25 inches of rain. This along with 2.8 inches on August 16, gave the vetch no excuse for not germinating. In less than 10 days, most of the seed had germinated and emerged. I was quite pleased with the resulting stand."

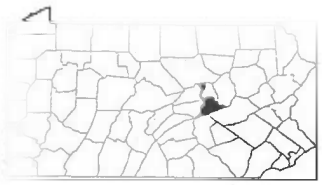
The soybeans were harvested in late October and yield checked at 44 bu./ac. The ground was soft, but damage to the still growing vetch by the combine tracks seemed minimal. Abram plans to plant corn into the standing vetch using minimum tillage in May of 1994. He is hopeful that it will provide a good amount of organic matter and fix some additional nitrogen.

COMMENTS

"Our whole-farm approach in 1994 will include interseeding hairy vetch into most (if not all) of our soybeans. We will submit a plan to ASCS prior to August in hopes of getting cost-share that is available in Pennsylvania for seeding cover crops.

"In addition to the vetch plots, in 1993 we also tried growing some corn without any herbicide inputs. Although we did not do a side-by-side comparison of chemical vs. mechanical control, our no-herbicide plots consisting of two hoeings and two cultivations produced acceptable results. In comparison, other fields where we used pre-emerge grass control and followed up with cultivation were very weedy due to a lack of moisture needed to activate the herbicides. We are planning to do more experiments with low/no-chemical farming in 1994. As we slowly wean our soils of the chemical fix and become more dependent on natural fertilizers (like manure), we believe our land will produce healthier plant and animal crops and our costs will be reduced as well."

ALVIN SHAFFER
SHAFFER PRODUCTIONS, INC.
NORTHUMBERLAND COUNTY



COMPARISON BETWEEN INTERPLANTED AND DOUBLED-CROPPED SOYBEANS

Alvin Shaffer and his family operate a 700-sow farrow-to-feeder operation in southernmost Northumberland County near Dalmatia. Alvin has been farming all his life and has watched the Shaffer operation grow grow dramatically in recent years.

Alvin raises field crops on 450 of their 600 acres, growing soybeans, barley and corn. Much of the farm is rolling land, and Alvin and his father have worked with SCS over the years to reduce erosion and runoff. The Shaffer operation also works with the local Crop Management Association to reduce chemical use on the farm. "Everyone is trying to get away from chemicals these days" says Alvin, "that is how we got interested in intercropping."

DEMONSTRATION

In this demonstration Alvin was interested in reducing chemical use and soil erosion by interplanting soybeans into standing barley. Yield and economic differences were compared with his standard double-cropping system.

SITE INFORMATION

Site size:	Six acres total, side-by-side comparison
Varieties:	Barley-Wysor, Soybeans-Pioneer 9361
	Barley planted using minimum till methods.
	Soybeans no-tilled in 15" and 30" rows.

RESULTS

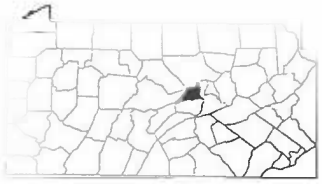
	Double-Crop Beans	Interplanted Beans
Planting date:	Barley 10/25/92 Soybeans 6/29/93	Barley 10/25/92 Soybeans 5/8/93
Herbicides used:	Round Up, Prowl, Linex	None
Chemical costs:	$19.37/acre	None
Yield - barley:	78.7 bu/ac	15.6 bu/ac
Yield - soybeans:	15" rows-26.4 bu/ac 30" rows-21.3 bu/ac	15" rows-21.9 bu/ac 30" rows-24.7 bu/ac
Profit - barley:	$151.89/ac	$30/ac
Profit - soybeans:	15" rows-$156./ac 30" rows-$122.7/ac	15" rows-$164.75/ac 30" rows-$146.07/ac
Combined profit:	barley & 15" soybeans $307.98/ac barley & 30" soybeans $293.96/ac	 $188.68/ac $182.35/ac

COMMENTS

"Soybean yield would have been slightly higher but the crop was hit by frost before it was fully mature. All of the intercropped beans seemed to have fuller and more pods than the double crop beans, even though the same fertility was used. I think the yields were quite good in the interseeded beans.

"Barley yield would also have been significantly higher if the soybeans had been planted two weeks earlier. The barley was in head when we interseeded the beans and we knocked down a lot of the crop. We were also late harvesting the barley and we nipped the tops off most of the beans. While I'm not sure if barley is a good crop to use in the system from an economic standpoint, interseeded beans are viable for erosion control and soil improvement."

PRESTON & WANDA BOOP
BRIAR PATCH ORGANIC FARMS
UNION COUNTY



Preston and Wanda Boop operate an organic grain and beef operation on three farms in Union County. They grow corn, soybeans, and a variety of small grains on 200 acres of crop land. The Boops are also working to implement a rotational grazing system for their 100 head of cattle. Compost is a major component of their farming system, providing the total soil fertility needs. The Boop farm is also an outlet for local municipalities and poultry producers to dispose of their 'waste' products.

Wanda currently serves as secretary of the Organic Crop Improvement Association (OCIA) Eastern PA chapter. Preston serves as president of PASA and is the certification chair for OCIA. He serves on the local school board and township zoning review board.

DEMONSTRATION

The demonstration tested the nutrient composition of two compost products which utilize different component materials.

COMPARISON OF COMPOST MATERIALS

Compost Test #1

COMPOST ANALYSIS REPORT
(APPROX. 50% BROILER MANURE AND 50% MUNICIPAL LEAVES)

	%		
Moisture	54.9		
Total Nitrogen	1.60	=	32 lbs/ton
P205	1.90	=	38 lbs/ton
K20	1.23	=	25 lbs/ton

Pile was turned periodically to oxygenate the micro organisms in the pile.

Compost Test #2

COMPOST ANALYSIS REPORT
(APPROX. 30% LEAVES, 30% BROILER MANURE, 30% STEER MANURE PACK WITH STRAW, AND 10% CLAY SOIL)

	%		
Moisture	35.2		
Total Nitrogen	1.07	=	21 lbs/ton
P205	1.14	=	23 lbs/ton
K20	1.79	=	36 lbs/ton
CA	0.90	=	18 lbs/ton
MG	0.45	=	9 lbs/ton

Pile was turned periodically to oxygenate the micro organisms in the pile.

RESULTS

Test #1 had higher nitrogen losses than Test #2 (although it also had a higher level of total nitrogen). The higher loss was due to the lack of available carbon during the first two weeks of the composting process. Phosphorous levels in Test #1 were higher than Test #2 due to larger amounts of broiler manure. Potassium levels in Test #2 were higher than Test #1 due to the 30% cattle manure pack. Cattle manure with straw contains higher amount of potassium than phosphorous.

COMMENTS

"The carbon in the leaves does not break down and become available fast enough for the large amounts of ammonia nitrogen that is available in the broiler manure. The large amounts of straw from the steer manure pack in Test #2 probably provided an early source of carbon to tie up with the ammonia nitrogen from the poultry litter. Also, the clay soil helps to buffer the early loss of nitrogen and provides clay molecules to be bonded with humus molecules at the end of the composting build up process.

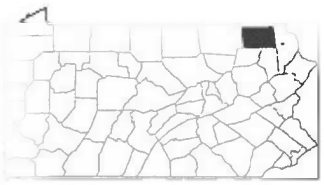
"The material components of compost appear to effect the analysis of our finished product. More phosphorous in -- more phosphorous out. The same appears to be true with potassium."

"We have recently started covering all compost windrows with a Top Tex blanket from Polyfelt. Top Tex sheds water but allows carbon dioxide and oxygen to pass through. We have found higher levels of nitrogen and potassium analysis in our 'Compost Pad Run Off Lagoon,' which would indicate that uncovered compost piles have nutrient losses from leaching during wet seasons.

"We have also noticed less ammonia smell if we turn or oxygenate the pile daily the first two or three weeks. This may also indicate less nitrogen losses.

"It would seem to us that better management in making compost is rewarded with a more valuable end compost product."

WINSTON & GINNY WRIGHT
COLD CREEK FARM
SUSQUEHANNA COUNTY



A COMPARISON OF CONFINEMENT AND PASTURE SYSTEMS FOR RAISING DAIRY CALVES

Cold Creek Farm, located in western Susquehanna County, is owned and operated by Winston and Ginny Wright and their four children. The main farm consists of about 300 acres. They also farm an additional 300 acres on two other sites, the furthest of which is 15 miles away. Their primary emphasis is a 100-cow dairy, with smaller enterprises of beef cattle, sheep and free-ranging laying hens. The farm is a cooperative demonstration farm with the Susquehanna County Conservation District, having hosted numerous intensive grazing tours over the last three years.

DEMONSTRATION

This project divided a small group of young calves into two different management situations. One group was raised in a confinement system with newborns in hutches, weaned calves in pens, and slightly older calves in tie stalls. The other group was placed at birth into a small training paddock, and fed milk out of a New Zealand-style group barrel feeder. As weanlings, the calves immediately pastured, moving ahead of the lactating cattle. The Wrights wanted to see if adequate growth on young calves could be achieved using a grass-based system.

RESULTS

Four calves were used for the project, two in each method. The calves raised in confinement were started in hutches and bottle-fed for the first three days, switching to buckets for the remainder of the eight weeks they received milk. While these calves were in hutches, they were given free choice water, second cutting mixed grass hay and a high energy 18 percent soft grain. By the end of the eight weeks in the hutches, each calf was consuming about 1 1/2 pounds of the grain and 1 pound of the hay. During this time the hutches were cleaned and rebedded twice.

After weaning, hay continued to be fed on a free-choice basis with the amount of grain being increased gradually, reaching a five-pound level at the end of the project period. Consumption of hay reached about four pounds per animal per day. Water was available at all times and was changed twice daily. The weanling pen was cleaned and bedded every third day. The tie stalls to which the calves progressed after three weeks in the pen were cleaned and bedded daily.

Shortly after birth, the pasture-raised calves, received about one gallon of colostrum and were dried off. They then were placed in a one-acre training paddock enclosed by three strands of high tensile fencing. The calves had a large three-sided shed for shelter. Two large juice barrels were used to feed milk to these calves beginning at two days of age. The first barrel had nipples placed all around the base and hung from the shed rafters about 18 inches from the ground. The second barrel had nipples placed 24 inches from the base. Tubing was attached to the nipples that required the calves to suck hard, drawing

milk from the bottom of the barrel, and in the process producing a lot of saliva.

According to Ginny, "The calves acclimated to the hanging barrel quite easily but needed a great deal of supervision and coaxing to use the second phase barrel. In a situation where calves are in a loose housing system such as the training paddock, these barrels are the only practical way to feed a group of calves at once."

The calves had a small feeder with the same 18 percent grain and second-cutting hay that was being fed to the hutch calves. A small sheep-sized tub provided water on a free choice basis. Consumption of grain and hay was similar to that of the hutches. From their first week, the calves began to pick at the grass in the paddock and spent most of their day there rather than in the shed. Each calf seemed to need only one or two confrontations with the electric fence to be convinced to stay in the paddock. The wires were placed at 16, 28 and 38 inches in height. This spacing seemed to discourage them from either crawling under or jumping over the fence.

When the weaned calves were moved into the normal paddocks, they were started in two paddocks next to the barn that had two strands of poly wire instead of one. This allowed for close observation and reinforced the "don't touch the fence" theory of behavior. In late June, the weather turned quite hot, prompting the Wrights to move to an idle fiberglass hutch into the paddock to provide shade and prevent potential heat stress problems. In reality, the calves valued the hutch more as a scratching post than as a source of shade. For many weeks, the Wrights moved both the 100-gallon water tub, float and hutch dutifully from paddock to paddock, until finally just the water system was moved. The calves' grazing habits at this point seemed similar to that of the older animals. They would graze for several hours early in the day and again in the evening, resting during the mid-day hours.

The calves' diet was kept at about the same level as it had been in the training paddock. Second cutting hay was offered along with the grain. The grain was consumed but the hay was totally refused. Each paddock was about eight inches high when the calves were turned in.

When the calves were taped on July 15, the Wrights found them to be below standard. At this point a decision was made to increase the amount of grain to the same levels being fed the calves in the hutches. Winston observed that, "Our initial hopes to run this demonstration identical to the way calves are raised in New Zealand gave way to the realization that the small size and subsequent lower production of New Zealand cattle would not fit our situation, and that the cost of purchased grain would be outweighed if these calves freshened at 24 months and were of adequate size."

The calves responded quickly to the increase in grain, and by the final taping in mid-September, were comparable to the housed calves in size.

COMMENTS

"It is our feeling that we can, and in the future will, put our spring and summer born calves out on pasture to be raised rather than in the hutches and barn. Although there does not seem to be great savings on purchased grain, there will not be the need for mechanically harvested and stored forages, bedding and manure handling, and the degree of labor involved in the traditional handling of these calves. The rotational grazing system combined with adequate grain levels does seem for us to have the ability to enable us to produce heifers that will in fact freshen in a timely and adequately grown fashion.

"Perhaps the most impressive knowledge we gained from this project which could not be shown on growth charts or in feed records was the calves' ability to graze, to cope with all types of weather conditions and to be moved from place to place, contrary to the popular thinking on the management of young calves today. We cannot help but feel that as these pasture-raised

heifers enter the milking herd, we will have an animal who is already thoroughly conditioned to our rotational system and in a position to perform in a superior manner to that of a barn raised heifer, to which the routine is all new."

CALF GROWTH CHART

Calf	DOB	Birth Weight	6/15	7/15	8/15	9/15
#1	3/1	62#	122#	153#	186#	240#
#2	4/1	74#	128#	158#	192#	251#
#3	4/17	72#	116#	131#	160#	238#
#4	4/23	68#	111#	124#	153#	231#

Calf #1 is a Jersey, #2, 3,, and 4 are Holsteins.

Calves #1 and 2 were traditionally raised;
Calves #3 and 4 were pasture-raised.

Calf #1 was weaned prior to the project beginning.

Pennsylvania Association for Sustainable Agriculture

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

Founded in 1992 to link and represent the growing sustainable agricultural interests in the state, PASA welcomes everyone who is interested in promoting food production systems that sustain farms and farmers, soil and water, people and communties, now and for the future.

The purpose of the association is to serve and promote sustainable agriculture, which is: "an investment in future food production and communities that is economically viable, ecologically sound and socially responsible."

By joining PASA you will be supporting our programs to: provide general education and outreach on sustainable and organic agriculture; establish a statewide network; initiate on-farm demonstrations and field days that highlight profitable and sustainable farming systems; provide technical assistance; encourage marketing strategies for sustainable and organic food products; and to promote sound farm policy and research. And you will be adding your voice to the thousands of Pennsylvanians working for a more sustainable agriculture.

PASA Membership Application

Name _____

Address _____

_____

County _____ Phone _____

Membership Categories

Individual		Business	
❑ Sustaining*member	$500	❑ Sustaining* Business	$1,500
❑ Two-Year Individual/Family/Farm	$45	❑ Business	$150
❑ One Year Individual/Family/Farm	$25	❑ Non-Profit	$50
❑ Student	$15		
❑ Other	$(_____)		

*Both Individual and Business Sustaining Memberships are lifetime memberships and may be paid in one full payment or in installments (up to five) within one year.

Donation .....$(_____)

Gift Membership .....$(_____) For: Name _____

Address _____

_____

Please clip and return with your check to:

PASA, P. O. Box 419, Millheim, PA 16854

Phone: 814-349-9856 Fax: 814-349-9840

Pennsylvania Association for Sustainable Agriculture
P.O. Box 419
114 West Main Street
Millheim, PA 16854
814-349-9856 (phone)
814-349-9840 (FAX)

American Farmland Trust
Center for Agriculture in the Environment
P.O. Box 987
DeKalb, IL 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. Basic annual membership is $20.

Pennsylvania Association
for Sustainable Agriculture
P.O. Box 419
114 West Main Street
Millhem, PA 16854

NonProfit Organization
U.S. Postage
PAID
Millheim, PA 16854
Permit #15

Pennsylvania Association for Sustainable Agriculture
114 West Main Street, Millheim, PA 16854