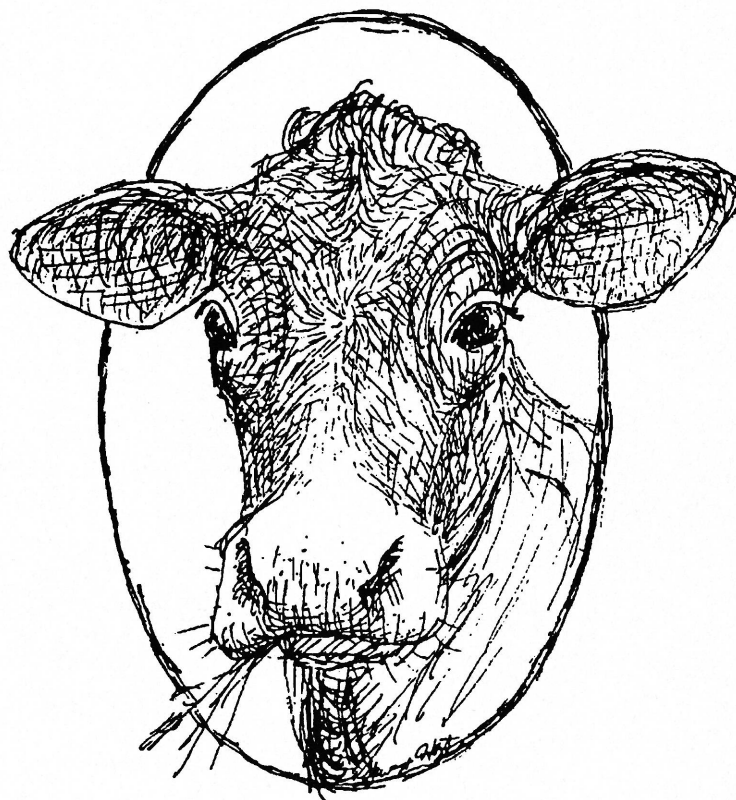


Proceedings
of the
Northeast Farmer to Farmer
Information Exchange

Livestock Meeting
1992 and 1993



edited by Enid Wonnacott

Northeast Organic Farming Association
University of Massachusetts Cooperative Extension System

with the support of the
Northeast Region Sustainable Agriculture
Research and Education (SARE) Program

1994

\$3.95

Table of Contents

Introduction	1
The Northeast Farmer to Farmer Information Exchange	1
Participating Institutions	2
Acknowledgments	3
Alternative Livestock Production in the Northeast	4
Participants in the Livestock Farmer to Farmer Group	4
Proceedings of the 1992 Meeting	8
Philosophical Round Table	8
General Soil and Crop Management	9
Fertility	9
Cropping Practices	10
Weed Control	11
Feed	12
Minerals	14
Vitamins	15
Pasture Management	15
Animal Management	16
Breeding	16
Dairy Cleansers, Sanitizers, Teat Dips	17
Herd Health	18
Parasite Control	19
Dry Treatment	20
Alternative Remedies - homeopathy, biodynamic remedies, probiotics	20
Financial management	22
Marketing	22
Regulatory Obstacles	24
Proceedings of the 1993 Meeting	25
1992-1993 Field Trial Results	25
Pasture Management	29
Pasture Height	29
Pasture Design	30
Measuring Feed Availability	32
The Profitability of Intensive Pasture Management	32
Trouble Shooting - questions and discussion	33
Cost of Production	35
Economies of Scale	36
Future Research Topics and On-Farm Experiments	37
References	38
Ordering Additional Copies of the Proceedings	inside back cover
NOFA Membership	inside back cover

Introduction

The Northeast Farmer to Farmer Information Exchange

The Northeast Farmer to Farmer Information Exchange, a project of the Northeast Organic Farming Association and the University of Massachusetts, held two-day meetings of small groups of farmers in the winters of 1992 and 1993 with the support of the USDA's Sustainable Agriculture Research and Education Program. Each group focused on one of five commodities for which there are significant barriers to organic production in the Northeast: apples, sweet corn, greenhouse bedding plants, livestock herd health, or strawberries. All of the participating farmers were interested in management methods which can be used on organic farms, but many of them are not organic growers and do not intend to use only organic methods.

At the request of the farmer participants, resource people were also invited to attend. These included researchers, faculty, IPM specialists and Extension agents from land grant universities, professional organic farming technical advisors, representatives of state departments of agriculture, and farmers recommended by others because of their experience and knowledge. Each meeting had a facilitator who assisted farmers in setting and following an agenda and moderated the discussions. Resource people sometimes made informal presentations but primarily were participants in discussions.

The Farmer to Farmer Information Exchange gave participating growers, and others reading these proceedings, a chance to become very familiar with the farming practices of a group of farmers. Farmers have an enormous amount of experiential knowledge about growing crops, raising livestock, marketing, managing labor, and all other aspects of running their farms. Farmers trying to grow crops using new or unusual methods may have experimented with techniques that few others have tried. In most cases, the results of these informal experiments never leave the farm to be shared with the larger agricultural community. Through these meetings and the written proceedings, the experiences of both farmers and researchers working on these crops can build upon each other.

A wide variety of activities has been generated by the meetings. Several growers in the sweet corn group set up trials in insect and weed control on their farms, with the help of Ruth Hazzard, Vegetable IPM Specialist at the University of Massachusetts and co-coordinator of the Farmer to Farmer project. At the urging of growers in the strawberry meeting, the Strawberry IPM Program at the University of Massachusetts did a scouting workshop in Vermont, at the farm of one of the Farmer to Farmer growers. Due to the interest of many of the livestock producers in alternative herd health remedies, a two-day homeopathy workshop was organized in Vermont. Several of the groups are continuing to meet in 1994, although the funding support from the USDA has ended.

These proceedings are a summary of the information provided by growers and resource people at the 1992 and 1993 meetings. They include discussion of specific production methods, marketing, and philosophy, and are intended to make available the expertise that was shared at the meetings to a wider group of farmers, researchers, and other interested people. They are not intended to provide complete information on how to produce these crops, nor to discuss only those production practices which have been verified by the research community. Additional sources of information on production and research-based information can be found in the list of sources at the back of the proceedings.

Participating Institutions

The Northeast Organic Farming Association

The Northeast Organic Farming Association (NOFA, formerly the Natural Organic Farmers Association) provides education and services for farmers, gardeners, consumers, and others interested in organic agriculture. NOFA has chapters in seven states: Connecticut, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. The activities of state chapters vary, and include such things as organic certification, conferences, farm field days, country fairs, and cooperative purchase of farm and gardening supplies. Together, the state chapters hold an annual summer conference, publish a bimonthly newsletter, *The Natural Farmer*, and engage in regional projects such as this one. Information on becoming a NOFA member is provided on the inside back cover.

University of Massachusetts Vegetable IPM Program

The University of Massachusetts Cooperative Extension System conducts Integrated Pest Management (IPM) Programs in many commodities, including three that were part of this project: vegetables (including sweet corn), strawberries and apples. The purpose of these programs is to assist farmers in reducing pesticide use in their crops, and to develop alternative pest management methods such as biological and cultural controls. Increasingly, IPM programs seek to integrate all aspects of crop and pest management into whole systems, and to direct research efforts into "bio-intensive" methods, many of which are compatible with organic farming practices. Farmers have always played a key role in using, evaluating and helping to develop IPM methods; this project provided further opportunities to build links between IPM programs and organic farmers across New England, and to understand how both researchers and farmers can benefit from direct information exchange.

Sustainable Agriculture Research and Education Program

Mandated by Congress in the 1985 Farm Bill and first funded in 1988, the Sustainable Agriculture Research and Education Program (SARE, formerly LISA) funds research in sustainable agriculture. The program encourages projects in which several institutions cooperate, including non-profit groups and other non-university institutions. In addition, the program promotes farmer involvement in planning and carrying out research, and in 1993 began giving "mini-grants" directly to farmers. In 1993, the Northeast Region SARE Program awarded grants to 35 farmers, totalling \$94,347, and 13 projects of research and education institutions, totalling \$1.3 million. Further information about the Northeast Region SARE Program can be obtained from:

Northeast Region SARE
Hills Building
University of Vermont
Burlington, VT 05405-0082
(802) 656-0471

Acknowledgments

The proposal for the Northeast Farmer to Farmer Information Exchange was developed by Margaret Christie, Alex Stone, and Enid Wonnacott at the request of the Northeast Organic Farming Association (NOFA) Interstate Council. Input for the proposal came from a range of farmers and researchers who attended planning meetings and a pilot meeting of the Apple Growers Group organized by Alex Stone. Several Extension personnel, including Ruth Hazzard of the University of Massachusetts Vegetable IPM Program, Dan Cooley, Sonia Schloemann, and Arthur Tuttle of the University of Massachusetts Apple and Strawberry IPM Programs, and Vern Grubinger of University of Vermont Cooperative Extension, provided input and agreed to help with the project.

Funding from the Northeast Sustainable Agriculture Research and Education program allowed the project to begin in 1991. Meetings were held in the winters of 1992 and 1993. Margaret Christie and Ruth Hazzard coordinated the project, while Enid Wonnacott and Alex Stone acted as workshop coordinators and helped to provide project direction. Ed McGlew managed the money and complicated billing procedures, and the NOFA Council, under the leadership of Bill Duesing, provided valuable oversight. Margaret Christie did the final editing and layout of the proceedings, and Jack Kittredge accomplished their printing and distribution.

A number of additional people helped to make the project successful. Thanks are due to the researchers who agreed to attend the meetings, particularly to those noted above, who helped to plan and facilitate the sessions and provide research and training help requested by growers between meetings. The cooks at Rowe Camp and Conference Center kept us exceptionally well fed at our meetings. Most especially, we want to thank the participating growers, who were willing to share both their successes and failures. Not only did they supply the bulk of the information presented here, review the proceedings, and provide useful editing suggestions and corrections, but their enthusiasm and humor made for wonderful meetings. Although much of the information presented at the meetings is available here, the pleasure of the company of the grower groups is impossible to reproduce on paper.

Alternative Livestock Production in the Northeast

Organic livestock production has been limited in the Northeast due to the lack of certified organic grain, and information about alternative herd health remedies. There are several farmers in each state who have gained a lot of practical experience in organic production systems through informal on-farm experimentation, but those farmers are rarely able to share information. For dairy farmers who have to be on their farms to milk twice a day, visiting other farms and going to conferences proves even more difficult. The purpose of this forum was to give farmers the opportunity to share the lessons they have learned on their farms, gain new ideas from interacting with other farmers, and identify future research priorities.

In 1992, the first year of the forum, the participants spent the majority of the time introducing their farming systems – what they feed, how they cultivate, how they manage their pastures and how they have treated mastitis. There was also ample time for discussing the philosophical underpinnings of organic agriculture. A summary from the first evening's discussion on strategies to expand organic and sustainable livestock production is included. In 1993, the second year the farmers convened, they chose to focus primarily on how to improve the management of their pastures, and the quality and diversity of their grass stand. In addition, they had a detailed discussion of marketing strategies and milk pricing.

The farmers that convened were a diverse group. Several had small, organic dairy farms, others had large, partially organic operations. There were some farmers who just raised sheep, and others who had a diversified operation of cows, sheep, chickens and pigs. Some of the participants are full-time farmers and others balance farming with off-farm jobs. Because all of the participants agreed that they benefitted from the diversity of the group and the perspectives of different producers, their comments are intermingled in these proceedings.

Participants in the Livestock Farmer to Farmer Group

Farmers

Kevin Engelbert has been farming Engelbert Farms in Nichols, New York since 1975. He was born and raised on the farm and is the fourth generation managing the family farm. He and his father are the only full-time workers. The Engelberts have a 100 cow dairy on 250 acres. They produce grass hay and intensively managed pastures. The farm is primarily bottom land with loamy soils and some hillside pastures. In 1981, the Engelberts made a transition from conventional management relying on synthetic fertilizers and pesticides, to organic management. Having grown field corn for the last time in 1992, they now do no tillage, use all of their manure for the top-dressing of hay fields and pastures, and rotationally graze their cows and heifers. Due to the lack of a facility to bottle their organic milk, they are no longer certified organic and market to a local distributor. Kevin notes that 60-75 cows would be the ideal number for him alone, but the stagnant price of milk, high property taxes (200+/cow), and the ever-increasing cost of expenses keeps him putting more cows through his double 4 herringbone parlor than he would like.

The Engelberts have converted their herd from an 'all around' herd to a 'spring' herd, to time their calving and peak milk production with peak pasture production. The cows are

all dry for at least two weeks in February. The health of their cows has improved by getting them off concrete and on pasture as much as possible.

Bill Kruesi, with the help of his wife, Kate, and their children, raise sheep on their 70 acre certified organic hill farm in Tinmouth, Vermont. The Kruesis have been farming organically since 1980. They currently have registered Coopworth and North Country Cheviot sheep, although they used to raise Finn-Dorsets until they had foot rot in the flock and had to restock. They did a voluntary quarantine for 4 years (1987-1990) and started again with clean animals. Bill entered vet school in 1993, so he is taking a brief break from full-time sheep farming.

When not in school, Bill balances his farming with agricultural consulting. He has 40 regular clients, consulting on cervical artificial insemination, flock health, and general sheep management.

Jack Lazor manages a Jersey dairy herd with his wife, Anne, in northern Vermont. They started as homesteaders with one family cow and soon expanded to 6 cows, supplying 25 families with all kinds of dairy products. In 1984, they were licensed as a commercial dairy. They are presently milking 26 cows and have 30 young stock. They own 170 acres, 100 acres open and 70 acres wooded. Their herd average is 13,000 pounds per cow. Jack processes the majority of their milk into yogurt, balancing that with cream sales. Butterworks Farm is a certified organic farm.

Russell Libby is the Research Director for the Maine Department of Agriculture and the president of the Maine Organic Farmers and Gardeners Association. Russell's research has included dairy cost of production studies, milk pricing and marketing reports.

Russell and his family have a 30 acre homestead in Mount Vernon, Maine. On their 10 acres of open land, they raise sheep, chickens and have a market garden.

Christoph Meier was the farm manager of Hawthorne Valley Farm until January 1994. He is currently working for the Demeter Association, a non-profit association that works with biodynamic farmers. Hawthorne Valley Farm is a 400 acre biodynamic farm in Ghent, New York operating under the non-profit Rudolf Steiner Education and Farming Association, Inc. The farm is currently being managed by Steffen Schneider.

Hawthorne Valley Farm produces organic grains, vegetables, milk, milk products, meat and eggs. The farm is run by three full-time people and four apprentices who milk 60 cows, both Holstein and Brown Swiss. In addition, they raise 16 replacement calves and 8 veal calves each year, as well as 12 hogs and 175 laying hens. The herd average is 13,000 lbs. per cow. They process their milk into cheese, quark, and yogurt which is sold at their own farm store, at the New York Green Market, to regional distribution centers and to community supported agriculture (CSA) members.

Kathy Morris and her husband Larry Siegel manage a 70 acre, hill top homestead in Massachusetts. They have been on their farm since 1977, working on improving the soil and creating a diversified operation. They have 6 cows (including dairy and beef), 6 pigs, and chickens. In addition, they market organic herbs, vegetables and manage a small tree farm. Their goal is to be as self-sufficient as possible and to bring in as few inputs as they can. To this end, they try to use as little cash as possible by bartering needs such as mechanical help and doctor visits.

Karl North and his wife, Jane, manage Northland Sheep Dairy in Marathon, New York. Northland Sheep Dairy is a seasonal, grass-based dairy, relying primarily on intensive pasture management for feed during the growing season, a hay crop for winter feeding and a small purchased grain supplement for late gestation and lactation. Their lambs are grown entirely on forage, and their long-range goal is 100% forage based livestock husbandry.

Karl and Jane purchased their 57 acre hill farm in 1980, and have worked since that time to construct a house, outbuildings and improve their land. Currently, they manage a semi-permanent hay/pasture mix on their 25 tillable acres. They began to build their sheep flock in 1985. They now have 50 Dorset and Finn/Dorset ewes and have been licensed for commercial milk and cheese production since 1989. Additionally, they sell lamb, mutton, wool and sheepskins. Their farm is certified organic by NOFA-NY, with products being sold predominantly through the farmers' market. Some of their cheese is sold to restaurants and through mail order, and some of their lamb is sold to regular clientele.

Camilla Roberts managed a 3 acre organic vegetable operation in Grafton, Vermont and worked with her husband, Silas, helping to run their 120 acre commercial dairy farm until 1992. They managed the farm for the Windham Foundation, with the majority of their milk going to Idlenot Dairy in Springfield, Vermont and marketed through Agrimark. While under conventional management, their Holstein herd had a rolling herd average of 22,700 lbs.

The discoveries they made in the organic garden about the benefits of soil health and family health inspired their transition to organic dairy production. In 1991, they decided to sell some of their cows to get out of debt and start farming organically with a smaller herd. They managed a 30-35 head mixed Jersey/Holstein herd organically for one year, with plans to provide meat, milk, eggs and vegetables to the local community, in a set-up similar to community supported agriculture (CSA). However, in 1992, Camilla and Silas were offered and accepted a job as the farm managers at Farm and Wilderness Camps, a year-round educational program. Due to their job change, they never marketed organic milk.

The farm at Farm and Wilderness is an integral part of the school and summer camp programs. Camilla and Silas accepted the job because it offered them the opportunity to answer questions about diversity, small-scale hill farming, and living and working in a community. Additionally, the job offered them a secure income and more time for their family. They have kept some land in Grafton to return to and commercially farm again.

Earl Spencer operates a commercial dairy farm on 250 acres in the Mohawk Valley of central New York. He milks 55 Holsteins and raises 65 head of young stock. Earl, his son-in-law and part-time hired hand grow silage corn, alfalfa, clover and brome grass as the primary feeds for the herd. All of Earl's land management is organic, but he purchases some non-organic feed and markets his milk through a local bargaining cooperative to a handler in New York City.

Earl started organic farming in 1972. It was a wet year, and he ended up harvesting about half of what he needed and faced either buying a lot of expensive feed or selling half the cows. He decided to sell half of his cows and found that he liked milking a smaller herd. His challenge became how to make a smaller herd economically sound. Realizing that he can't control the price of milk, or the weather, he made management decisions that he had control over – reducing the amount of grain fed to his animals and reducing the amount of chemical fertilizer. Earl said that they made changes slowly, taking 8 years to make the transition to organic management. "Just like you wean a calf off milk, we weaned ourselves off chemicals."

Earl believes that "it has been working with the natural order of things for our farm that has made our success possible. The emphasis has changed from learning what new chemical to put where to developing faith in the natural order and then seeking that order out for each individual farm operation. It is our responsibility to learn what that natural order is and learn to live within it - instead of always trying to change it. This way of farming is not easier, but the stress is reduced because we are working more closely with nature - stresses are reduced on soils, cows and therefore people. The whole philosophy reduces stresses, that's what being a farmer is all about."

Leila Stockwell has been farming since 1980 in Albion, Maine. She raises 20 Dorset sheep, primarily raising lambs for the Christmas and Easter markets. Additionally, she raises 200 White Rock Cross broilers a year and has a small flock of laying hens. Leila raises 7.5 acres of hay which produces enough to winter over her flock. To supplement the hay, she purchases non-organic corn, oats, barley and soybean meal. In addition to managing her farm, Leila is a livestock nutritionist, selling vitamins and trace minerals.

Peter Young, together with his wife Nancy Everhart, purchased the Hill Farm of Vermont in 1982. Peter explained that he entered farming from an intellectual perspective—a realization that New England is dependent on cheap foods. Now they own and manage a 150 A farm (30 A open), and milk 10-12 Jerseys, with a total of 22-24 animals including young stock. Their herd average is 12,500 pounds. They bottle 350 gallons of certified organic cream-topped milk per week, packaged in quarts, half-gallon and gallon containers. Their primary markets are food cooperatives, and they also sell to restaurants and supermarkets. The main goal of their farm is to improve the fertility on their 30 open acres, and to make the grass land as productive as possible. They currently intensively manage their pastures and produce silage and hay. The farm improvements Peter is considering for the future include seasonal milking and relying more on grass for primary feed.

Resource People

Enid Wonnacott was one of the designers of the Northeast Farmer to Farmer Information Exchange and facilitated the livestock meeting in 1992 and 1993. Enid is currently the Director of the Northeast Organic Farming Association of Vermont, where she has been since 1988. As part of her job at NOFA-VT, Enid does organic certification field inspections, provides technical assistance to livestock farmers, and is working to establish an organic milk marketing cooperative in Vermont.

Lisa McCrory has been a pasture grazing consultant for the University of Vermont Pasture Management Outreach Program since 1990. Lisa is finishing her master's degree in pasture grazing management at the University of Vermont as she continues her work in the Pasture Management Outreach Program. Lisa has gone through the basic Holistic Resource Management starter course, and incorporates the HRM principles in her consulting. She participated as a resource person at the 1993 meeting.

Margaret Christie facilitated the livestock group meeting in 1992. She is co-coordinator of the Northeast Farmer to Farmer Information Exchange, and was coordinator of the Second-level Apple IPM Project at the University of Massachusetts from 1989 until 1993. She is currently a student in the Rural Sociology Department at the University of Wisconsin, Madison.

Proceedings of the 1992 Meeting

Philosophical Round Table

While the farmers were gathering at the conference center on the first evening, our introductions expanded into a discussion of the future of organic dairy farming. The dialogue which follows is in response to the following question: How can we help to expand the sustainable or organic livestock movement?

Earl Spencer started the discussion, commenting that "people are interested in coming into the movement, but you have to have a philosophical approach first. Some people just want a good return on their investment, just want us to cookbook it for them – this movement can not be cookbooked. The strategy is to plant the seed so they want to be converted, so that farmers become farmers and not agribusinessmen. We need to put culture back into agriculture and replace the word 'business.'"

Kevin Engelbert recommended that organic farmers start advertising in mainstream journals, noting that there are no corporations putting ads in magazines promoting alternative practices. Earl countered this idea with his frustration of putting articles in publications, "editors and readers want numbers. Farmers have become robots, thinking only about how to make the most money. I refuse to do numbers, and am more interested in talking concepts and end results. Farmers are the experts, knowing what their fields can do, you don't need to be a technical expert." Jack Lazor agreed that organizations such as the Crop Management Association can replace farmers looking at the fields themselves. He gets real pleasure out of walking around and knowing what is growing and how his plants are doing.

Camilla Roberts and Peter Young questioned how to best get young people involved in agriculture. "How do you best expose young people to the art and culture of farming and introduce them to the enjoyment of walking in the fields?" Earl Spencer believes you have to start young, starting them early with education. The older people have already made their minds up. It's important to teach them the whole ecosystem and to make the kids aware of different agricultural systems. Jack Lazor commented that it would help if consumers knew more, and had the knowledge to talk about the wholesomeness of life. Several participants noted that consumers can work against farmers, as vegetarians or animal-rights activists. We need to be able to communicate that there is responsible livestock production, that not all animals are feed-lot farmed or responsible for tropical deforestation or water pollution. We need to be able to communicate about an alternative system. Fred Kirschenmann, a Midwestern livestock producer and sustainable agriculture spokesperson, argues that it is not the animals that cause the problem, but the industry itself. Animals are valuable, he claims, because they are able to convert roughage. Camilla agreed that we need animals on pasture that we can not use for other purposes.

Peter Young commented that many dairy farmers believe that their product is not a good food because of cholesterol concerns. No other adult mammals consume dairy, but we have evolved with it and well-produced dairy products can be a good part of the diet. We have to address toxins in the food, not only cholesterol. He also thinks that the health implications of homogenization should be more widely addressed. Peter Young's farm

currently markets non-homogenized organic milk. Leila Stockwell cited research results from England and Wales that showed that individuals consuming whole milk and butter versus those having no milk and only margarine had a lower number of heart attacks. The participants agreed that these kinds of results need to be publicized. Why are our milk promotion boards not discussing this? Milk is a valuable nutritional product, but that message gets overshadowed by consumers' concerns about fat and cholesterol. Peter mentioned that methane production from cow manure is also an issue working against dairy farmers, even though rice fields give off more methane than cows.

The producers ended the conversation by discussing the beauty of the ruminant animal. "Our market is the most ecologically aware and it's still hard to explain the beauty of the ruminant animal. The choices people make buying food can cast a vote for the environment – meat production can be good for the environment."

General Soil and Crop Management

Fertility

All of the farmers discussed their use of manure as a primary fertilizer. Karl North has found that a deep litter rain cover and composting are essential to the success of manure based farm fertility, not only to maximize fertilizer recycling, but for animal health and to minimize air and water pollution. North explained that leachate from manure piles or odor from manure as it is spread are examples of fertility loss from his farm.

Kevin Engelbert said they had reserves in the soil by 1980 from spreading manure from their storage pit, which was built in 1976. They had already begun cutting back on their use of commercial fertilizer during this time, and, in 1981, quit using purchased fertilizer completely. The manure storage pit was the key to being able to maintain soil fertility without using chemical fertilizers. Manure must be looked at as an asset, not a liability. They agitate and pump their manure with a Houle manure pump, and spread with a 2400 gallon New Holland spreader, which works with liquid, semi-solid, or solid manure. Any solid manure left behind is loaded with a skid-steer loader once as much liquid manure as possible has been removed. As previously stated, all the manure is used to top-dress hay fields and pastures. Kevin has always followed the adage, "feed the soil, not the plants," and believes that all of his successes come back to the soil. He credits his belief in soil management to explain why his herd average did not drop after making the transition to organic production.

Although Earl Spencer used to apply 30 tons of chemical fertilizer a year, he now relies on manure, green manures and cover cropping for fertility. Because he depends on the farm to generate most of its own fertility, he does not sell crops of any kind. Poor hay is chopped and used as bedding. Everything else is used as feed and is returned to the soil as manure. Similar to Kevin Engelbert's philosophy, Earl notes "We are firm believers in feeding the soil and then letting the soil feed the plants." He collects manure with gutter cleaners which empty into a manure stacker, an elevator which piles manure in a concrete enclosure outside the barn. He uses mulch hay for bedding, so he gets a fairly solid manure which will stack. Earl then spreads the manure on corn ground in May at 10 tons/acre.

After spreading, Earl or his hired hand work the manure in with a chisel plow or disk harrow that same evening to minimize nitrogen loss.

Earl's crop rotation also serves to maintain the soil fertility. After one or two years in corn, he seeds a strip with an alfalfa/grass mixture (12# alfalfa: 6# brome: 1# red clover) and keeps it in hay for 3 or 4 years. Because he relies on the fertility in the manure carryover, Earl does not fertilize his hay. He believes that manure takes about 4 or 5 years to totally break down, therefore providing residual fertility for the succeeding hay crops.

Peter Young cleans out his straw bedded pack (result of wintering animals in loose housing on straw), stacks the manure in windrows, and lets it heat up once before turning it in the spring. The partially composted manure is spread after the first cutting of hay (see page 26 for subsequent changes in this practice). Jack and Anne Lazor also partially compost their manure. Their manure is gutter cleaned out of the barn and stacked on a pad outside in a breadloaf formation. Jack adds rock phosphate in the gutter behind each cow, "so urine in the gutter will dissolve the phosphorous, stabilize the nitrogen and keep the ammonia down." Jack then spreads the manure, with each field getting fertilized every 3 or 4 years. He also relies on other minerals to maintain his fertility, including sul-po-mag, mag-ox, rock phosphate and dolomitic lime. In addition, cover crops and green manures are used to maintain soil fertility. When bringing in new land, he seeds a combination of oats and Canadian field peas (2 oats : 1 peas) at approximately 120 pounds per acre. Jack also underseeds clover in his corn, spinner spreading the clover at the last pass with his cultivator. He underseeds mammoth red clover in the barley, allowing him to combine the barley in the middle of August, and then uses the red clover as stockpiled feed, turning out his animals for grazing in the beginning of October. Another benefit of underseeding, according to Jack, is that "after the clover is grazed, if you only use a field cultivator versus a disk (therefore not tilling too deep), you will get 40-50% second clover growth. This will set seed and fall off into the soil. When you seed the hay the following year, you will have red clover integrated into your new stand."

Hawthorne Valley Farm also relies fully on their own manure and biodynamic preparations for fertility. The farm has been in biodynamic cultivation since 1976 and has been working to be self-sufficient in feeds and fertilizers. The barn manure is stacked and used on the corn fields at the rate of 23 tons/A. Manure is also composted for vegetable and grain production. In the field, Christoph sprays horn manure (biodynamic preparation 500) on the soil before planting and silica spray (biodynamic preparation 501) on the plants during growth at least once. Chamomile, oak bark, stinging nettle, dandelion, valerian and yarrow are also made into herbal preparations and inserted into the manure and compost. Christoph comments that "although you may not see immediate results of the preparations, you experience a remarkable effect over the years in overall health and fertility of the farm organism."

Cropping Practices

Kevin Engelbert has moved away from corn production, not because he couldn't grow corn without chemicals, but because of the high capital costs of the machinery involved in tillage, soil fitting, planting, harvesting, transporting, storing and feeding corn silage. His final seedings of his fields included reed canary grass, which will eventually replace the alfalfa as it dies out, and should result in permanent stands of top quality, high yielding

forage which will be harvested and stored as hay and baleage. He will rely on more pasture, and buy in more grain to replace the energy lost from not growing corn silage. He has found that the crops he has grown organically are more resistant to drought than when he was growing them under conventional management. In addition, nearby farmers who are using atrazine are beginning to get atrazine resistant lambsquarter.

Christoph Meier uses a mold board plow to prepare the heavy soils, using a chisel plow on the lighter soils. The grains are cultivated with a spring tooth harrow and undersown with red clover. The corn is cultivated with sweeps and danish s-tines on the cultivator. Christoph has tried underseeding rye in corn as a late cover crop, but it did not work well, so now he chisel plows and plants barley and oats in the spring.

Earl Spencer fall plows sod to prepare for corn the following spring. In the spring, he chisels in manure, disk harrows and uses a cultmulcher to encourage weed growth. Earl noted that the cultmulcher makes a good weed seed bed which encourages early weeds and then he comes back with the springtooth drag and knocks them down. The springtooth harrow then creates a rougher surface and discourages weed development. For corn cultivation, after the manure is worked in, he works the soil about once a week until planting time, which is approximately the third week of May. After planting, he cultivates the corn weekly with a spike tooth drag. This is necessary to get the weeds that grow in the row as well as knocking back the weeds between the rows. The spike tooth is used until the corn is at the four leaf stage, then he switches to a rolling type cultivator, a 4-row Lilleston. He cultivates with this three more times, until the corn is close to knee high in early July. After the last cultivation, he broadcasts about 20 pounds of annual ryegrass per acre using a rear-mounted, spinner type fertilizer spreader. Earl said that the ryegrass will germinate but will not really take hold until fall. The benefits of the ryegrass are that it's a cover crop for the corn stubble, it discourages weed growth, it adds organic matter to the soil when he incorporates it the following spring, and he can graze the cows on it.

Both Kevin Engelbert and Earl Spencer discussed the positive changes in their soil structure when they switched to organic management. Kevin says that earthworms are a good indicator of the quality of your soil. In 1980, before switching to organic management, he could not find any earthworms. He also noticed that he had to plow in 3rd gear to get through his soil, and that water was pooling. Now he has no drainage problems and his soil structure has greatly improved. Earl found that his soil loosened up under organic management. Under conventional management, Earl used a 5 tooth chisel plow, pulled with a 75 HP tractor with dual wheels. Now he can pull a 7 tooth chisel with a reduction to 65 HP with out duals. Whereas compaction used to be a problem, his soil has become much more friable and easier to work since he has improved his soil structure. This has the secondary benefit of reducing fuel costs because he is not moving through such compacted soil.

Weed Control

Kevin Engelbert has had a lot of dandelion pressure in his alfalfa fields and pastures, because they go to seed so early. He has chosen to control them in hay fields by planting reed canary grass, which will eventually take over completely. In pastures, cows love the dandelions, and the dandelion populations are decreasing every year because they can't tolerate intensive, rotational grazing. Clovers and native grasses are thriving on these

pastures with no purchased inputs. The only plants Kevin has found that cows will not eat are thistles, or anything with pricklers. He added, "cows don't like any plant that is mature, but will eat virtually anything that is young and lush."

For weed control, Jack Lazor has tried many different types of cultivators. He used a row-crop cultivator and a rotary hoe on the corn, noting that "if you plant 1/2" deeper than recommended, you can cultivate with the rotary hoe until the corn is 3-4" high, and you can do more pre-emergent weed control." He also uses the rotary hoe to cultivate soybeans. He uses a Lely weeder on any crop that is well rooted, and has found the Lely is doing a good job at quack grass control. Jack notes that if you want to underseed with a legume, the Lely is not the best choice, unless you weed the grain first. You have to get the grain in early before the warm season weeds kick in.

Ragweed and quack grass are the biggest weed problems at Hawthorne Valley Farm. Christoph puts his emphasis on building a healthy soil, instead of fighting and killing weeds and pests. "If you have grubs and parasites, it is a sign of weakness. If you plow too deep, too wet, put too much fertilizer on, you have encouraged the moon forces of wetness and lush growth which have encouraged parasites. If there are parasites, beneficial insects will take care of it."

Feed

Purchasing organic grain is one of the limiting factors in certified organic livestock production. There are few sources of organic grain in the Northeast, and those limited sources often have to be transported great distances and at elevated prices compared to conventional grains. All of the participants shared a desire to decrease their dependence on purchased grains; instead, they want to learn how to use their pastures more efficiently, learn more about the feed value of forages, and become more self-sufficient in their feed requirements.

The difficulty of obtaining organic grain and the expense is felt the most in poultry and pork production, because these animals do not forage efficiently and require grain. Leila Stockwell feeds her broilers conventional grain because she could not afford the increased cost for organic. She currently sells her birds for \$2.00/lb., and estimates that she would have to sell for \$3.50/lb. if they were fed organically. She doesn't believe the market will bear the increased prices. Kathy Morris does feed her birds organically, paying \$11.00/cwt. (hundred pounds) for corn and \$24.00/cwt. for soybeans, which includes \$2.00/cwt. for shipping the grain from New York state into Massachusetts. Because they have to purchase organic grain, she has tried to raise the breeds that are better at foraging. Leila has found that Aracana crosses forage well, Cornish Rock crosses do not. She said the Cornish Rock cross weigh 10 lbs. when they are 10 weeks old and dress out at 5 lbs. They grow too quickly and have a hard time supporting their weight. She is interested in a bird that will not grow as fast, but forage better. Bill Kruesi recommended Dominique as a breed that forages well and broods well, but they can be a bit scrawny. Jack Lazor said the Dark Cornish forage fairly well, are good brooders, but they are small and take a while to fill out. Camilla Roberts pointed out that the meat is not as tender when birds forage and they have a "gamey" taste, and questioned whether consumers would like that. In reviewing these proceedings, Karl North cited a 1993 study at State University of New York at Delhi which

compared the taste of grain- and grass-fed lamb. The study found that the grass-fed lamb scored consistently higher.

Dairy farmers and sheep producers, although being able to rely more on forage than grain concentrates, have still struggled with finding the quantity and quality of organic grain they need at an affordable price. Kevin Engelbert feeds alfalfa hay, shell corn and corn silage to his milkers, supplemented with 200 tons of purchased non-organic grain per year. His four cuts of alfalfa tested out to 18%, 20%, 21% and 24% protein. Kevin believes that good alfalfa has as much to do with calcium levels as with pH, based on soil testing done on his farm and the writings of William Albrecht (see references). Kevin found that there was a direct correlation between the levels of calcium in a field and how well alfalfa did, just as there is a direct correlation between pH levels and alfalfa's health and survival. The pH had increased on his farm, but is declining now due to acid rain and he is having to apply some lime. Kevin believes that more acid is applied with chemical fertilizers than anything else and believes that if they had no acid rain problem, they would not have a pH problem. Acid rain and his farm's flood-prone land have led Kevin to move to reed canary grass as his primary forage, because it does not require liming or high pH soils and is not susceptible to flooding, unlike alfalfa. Overall, Kevin believes that he is growing better feed now than when he was farming chemically. His butterfat has gone from 3.8-4.2, with an average of 18,000 lb., a difference he attributes to the quality of his crops.

Peter Young grows all of his own forages on his farm, and hays a neighboring piece. He owns one tractor (35 HP Kubota) which he uses to flail chop his grass into a wagon and side dumps it onto black plastic. The plastic is folded over to make an envelope and then sealed. He vacuums out the air daily with a PTO driven vacuum pump, reducing the volume to 25% of what it was. Peter has found that the best way to make silage in his system is to mow the grass into 4"- 8" segments, and pick it up just after cutting, not once it has wilted. Peter explained that cows can ruminate better on longer grass, noting that he would have to feed hay with shorter, chopped grass to get rumination going. Although the long grass does not pack as well, Peter has found that if the grass is packed wet and not wilted, the increased moisture will help make it pack better. An additional benefit of picking it up wet is that he only has to make one trip over the field. A potential drawback of the long, wet grass is that he gets some silage effluent coming out of the pile. Peter also questions whether the palatability is as high as with wilted feed. The grass silage tests out at 18-19% protein. The system is a good alternative for his farm, although he has found that the feed is difficult to get out.

Peter's ultimate goal is to get away from his reliance on purchased organic grain by increasing the feed value of his pastures and forages. He currently purchases organic feed from New York state to balance his ration. He feeds 1/2 lb. of shell corn, twice a day to his milkers and pasture in the summer. In the summer, he feeds a 1:55 grain to milk ratio. During the rest of the year, he feeds 1:3 or 1:5 pounds of grain to every pound of milk. He feeds out whole soybeans instead of rolled because the cows will digest it in the second stomach, thus digesting it faster.

Jack and Anne Lazor attribute a lot of their success to their good feeding program. They grow almost all of their own grains, feeding corn and barley, topdressed with roasted soybeans. Jack said that corn and barley provides a good, balanced feed, with the "energy in the barley utilized in the early stomachs and the energy from the corn utilized in the end."

They feed 1 pound of grain for every 2.5 pounds of milk for the high producers in early lactation, 1 pound of grain for every 3 pounds of milk for the middle producers and 1 pound of grain to 3.5 pounds of milk for the late lactating cows. They feed a total of 7,000 bales of hay, 1 silo (16'x50') of alfalfa haylage, 25 tons of dried ear corn, 15 tons of barley and 5 tons of roasted soybeans per year. Last summer, Jack also grew triticale and Canadian field peas as a nurse crop for his alfalfa. He found that it can be a good feed, as long as the triticale is cut on time. The triticale matures quickly and can get woody if let grow too long.

Christoph Meier does not believe in excessive grain feeding because it will stress the cows. Therefore, they do not aim for maximum production and cows are not fed to their full potential. Their grain to milk feeding ratio is 1:5. To feed the cows and other livestock on the farm, they produce 36 tons of their own grain and purchase an additional 62 tons. Hay is the basis of their ration in the winter, accompanied by corn silage and small grains (oats, barley, wheat and peas.) In the rest of the year, the cows get less grain, but they always get hay.

When Earl Spencer was trying to reduce his production costs, he figured his grain was his biggest expense. He used to feed greater than 3 tons per year per cow and now feeds 3000-3500 pounds/year/cow. Earl commented that, "Cows are designed to handle a lot of roughage because they are ruminants, so let's use the cow as she's designed, instead of trying to change her, and save grain for single stomach animals." Earl produces all of his own roughage—grass silage and alfalfa hay for summer and corn silage with alfalfa hay for winter. Because he is no longer using chemical fertilizers, a practice he believes accelerates plant growth, he now feels as if he is growing a more nutrient dense feed, with every cell of alfalfa being more concentrated. Because the plant is more nutrient dense, he believes the cow is getting more per mouthful. The grain he feeds is a mix of soybean, oilmeal, roasted soy and distillers grain, resulting in a high protein (35%) ration purchased from Nutrena. Because most of the cows' energy is from the corn silage and hay, the grain is used only to balance the ration instead of being used as primary feed. The most grain any cow gets on a daily basis is 12 pounds.

Minerals

Many of the farmers were interested in the benefits or necessity of feeding minerals. Kathy Morris said that in England, certified organic farmers are not allowed to feed minerals unless you can prove a deficiency. She noted that mineral mixes are designed for animals who are in confinement housing. If animals are grazing on managed pastures, they should be getting the necessary minerals. Peter Young agreed, stating that an increase in mineral feeding came about with the practice of confinement housing and grain feeding. There are fewer minerals in grain than in forages; on a dry matter basis, calcium levels in corn are 10-20% of what they are in forage, for example. Additionally, with grain feeding, the productivity of the animals is higher and the minerals wash right through. Peter believes that they probably have enough minerals feeding a high forage diet, but they still feed a yeast, acidophilus, seaweed and mineral combination (Dairypower) because he is still bringing back depleted soils. He stopped feeding minerals for a while, and found an increase in his milk's Somatic Cell Count (SCC); he questioned whether or not this was just coincidental.

Kevin Engelbert fed balanced rations by the book in 1978, but now he doesn't feed any minerals, just free choice salt blocks. According to Kevin, "weeds are a cows medicine," and he believes that the roll weeds play in providing cows with vitamins and minerals has been largely overlooked. He also believes that purchased minerals may "pass right through" a cow, without ever actually being available. He feels that the quality of the nutrient source is most important. Similarly, he questions whether cows get greater nutrition from a conventionally-produced alfalfa with 25% protein than from an organically-produced alfalfa with 18% protein. "If I need more protein, I'd rather buy more soybeans from a farmer than chemicals from a chemical company to goose the protein levels in my alfalfa." Additionally, Kevin said that he used to have trouble keeping the butterfat in his milk to 3.5%, even with supplements, but now, without supplements, he has no problem.

Hawthorne Valley farm is interested in finding natural mineral additives to add to grain. Right now, they use a commercially available product (Young's minerals) and add kelp and sea salt.

Jack Lazor has used X-tra factors minerals, sprinkled on top of his grain at feeding time, but he is now using Nutrena minerals, or none at all.

Vitamins

The participants questioned whether there are more vitamins in organic versus conventional feed, and whether relying on a forage-based diet provides more or less vitamins than a grain-based diet. The group commented that conventional feed consists of by-pass protein, and is heated up to 600 degrees to remove the protein. Organic farmers feed whole grains, which has the oil intact; farmers wondered whether that means that there are more vitamins? The participants noted that the primary vitamin needs of cows are A, D, and E, and both brassicas and soybean oil are high in vitamin E. The farmers agreed that they would like to know more about the vitamin requirements of their animals, and cited the Merck Veterinary Manual as a good starting place for information about general nutrition.

Pasture Management

All of the farmers rotationally graze their animals. Pasture management and rotational grazing stood out as one of the topics that all of the farmers were interested in, and became a focus for the 1993 meeting. The accompanying proceedings from 1993 provide more detail on pasture management and grass farming.

Kevin Engelbert reported that his pastures are 1 1/2 acres each. He clips pastures and top-dresses them with manure. Bill Murphy, a pasture consultant from Vermont, says that this increases the "zone of repugnance" and cows will not come back to eat. Engelbert has not found this to be true, hypothesizing that the soil is active and readily accommodates the fertility. He uses a flexible tine harrow to evenly spread the manure after grazing, he thinks that this helps the manure break down more quickly. He finds his limiting factor is getting water to his paddocks. He is using a 100 gallon rubbermaid tub, which works with New Zealand water systems. Bill Kruesi recommended putting in-field waterers along the fence line, not in a corner. Additionally, he recommended using slant-bar feeders if animals are getting their feet in the water tanks and tipping them over. Sheep, especially, are picky

drinkers. Their water should be changed regularly and their waterers kept clean or they will not drink enough.

Many of the participants noted that the longevity of their animals has improved on pasture—they used to lose cows because they were on concrete. Many criticized conventional dairy farmers for being so obsessed with herd average and production records that the life of their animals are being shortened.

In a discussion of how different breeds and species of animals do with grazing, Engelbert commented that his Holsteins graze fine. Christoph Meier has both Brown Swiss and Holsteins which graze well. Camilla Roberts found Jerseys graze more aggressively than Holsteins, that they can convert forage better, and are the preferred breed if you have a limited land base. Peter Young added that when pastures are steep, it is beneficial to have a lighter animal, like a Jersey. Earl Spencer said that if they're on good feed, any cow will graze. Colored breeds may work harder at poor feed. He has to feed stored feed often in the summer because they have a native pasture. Christoph noted that they put bells on cows in Switzerland. The bells are put on the best eaters and it keeps them eating. Once a lead cow lies down, others will too, so with bells, the music keeps them eating.

Animal Management

Breeding

Karl North said that sheep in the eastern states have been bred for success in a high concentrate diet feed lot system for so long, that they must be reprogrammed before they will do well in a grass-based system. He noted that some farmers are reluctant to go to sales to buy animals because they don't know if their breeding has selected for forage utilization.

Peter Young wondered how long it would take for animals to be valued for their grazing ability versus their milk production. Peter said that "bank loans are frequently based on production, so it is difficult to get dairy farmers talked into feeding only grass. Many farmers are discouraged from rotational grazing because their production may drop and the market for their animals will decline. When they sell cows, their reputation is based on production." He added that currently there is no market for heifers who are just good grazers.

Bill Kruesi noted that the issue of scale is important to consider when breeding. He said that, in New England, quality will be our focus, and our means to compete as small farmers. Our small herds can survive because of the long history of breeding. Being able to sell good breeder stock is an important component of making a livelihood.

Camilla Roberts discussed the changes they saw in calving when they made the transition from conventional to organic management. She believes the increased metabolism of higher producers, caused by feeding yeasts and by-passed fats, were causing difficult calvings. They thought it was the Holstein breed, and starting going into Jerseys. But under organic management, they found the Holsteins could handle their calves better, in part because the calves were smaller.

Because Jack Lazor's farm is certified organic, he is not allowed to use breeding hormones on his cows. He has found that by breeding cows every 20 hours for 3 days, he has been able to settle cows and has not had to rely on the use of a breeding hormone.

Dairy Cleansers, Sanitizers, Teat Dips

Many of the farmers are interested in moving away from acid based cleansers, and have experimented with using other products for cleaning, sanitizing and teat dipping. Several of the participants discussed their frustration that the Food and Drug Administration has not worked on approval of such products as hydrogen peroxide as a sanitizer. Christoph Meier added that given the interest in organic dairy farming and the strong environmental movement, somebody should be working on developing a clean product. Many of the current cleansers are high in phosphorous, and Peter Young is concerned that the combination of chlorox and acid rinse can produce phosgene in a milk room.

As an alternative, Peter Young uses 1/2 ounce per gallon of 35% hydrogen peroxide (technical grade) to sanitize his equipment, and a combination of hydrogen peroxide and Shaklee's Basic H as a cleaner. He brush washes his equipment primarily with Shaklee's Basic H, adding apple cider vinegar (1/4 cup/1 gallon of water) twice a week. For the pieces of equipment that have CIP (clean in place) application, he uses 2 ounces of hydrogen peroxide/gallon of water, with some Basic H to break the surface tension. Peter tested samples of his raw milk to make sure that he was maintaining his milk quality, and found that his raw counts have improved or stayed the same with his cleaning and sanitizing system. He questioned why you need to use conventional cleaners and sanitizers which give you residual kill, if you're going to use the products again before the next milking. He also uses hydrogen peroxide as an udder wash (1/2 ounce of hydrogen peroxide to 1 gallon of water), commenting that "when you finish milking an animal, there is a concentration of very sweet milk at the end of the teat. The value of a teat dip is to dilute the strong milk right at the end of the teat - even water would work. You just want to dilute the sugary solution, because that is the bacterial environment." Camilla Roberts also tried using hydrogen peroxide, but found that they started seeing a film appear in all their glass pipeline. Fearing a bacteria increase, they went back to conventional cleansers. Concerned about teat irritation from using hydrogen peroxide as an udder wash, they do not pre-wash, just spray the teats after milking with an iodine solution. Camilla's father-in-law is a vet and stressed the importance of spraying the teats, instead of using a dipping cup. He explained that any solution that goes from cow to cow to cow can carry bacteria.

Jack Lazor also uses hydrogen peroxide, mixed with epsom salts as an udder wash, and post-dips with iodine. Jack explained that he post-dips his cows because the action of the vacuum keeps the teat open to bacteria.

When Christoph Meier worked at Hawthorne Valley Farm, they used an udder wash of washing soda and a post milking dip of water and chlorox in the morning and comfrey solution in the evening. The solution is made with comfrey leaves and extracted with alcohol. Christoph explained that this provides good soothing action in the teat. They wash their lines with washing soda (Arm and Hammer) and chlorox (approximately 1 ounce per gallon of water), but do no sanitizing. The important thing, according to Christoph, is to have hot water in the pipeline (in excess of 170°F). Earl Spencer uses the commercial teat dip Nolvasan and does an acid rinse of his lines, but does not use a sanitizer.

Herd Health

Farmers have had little opportunity to learn about alternative herd health strategies. They have relied on written resources, on-farm experimentation and discussing their experiences with other farmers whenever possible. There is only one large animal homeopathic vet in the Northeast, who many farmers rely on for phone consultations. Russell Libby discussed homeopathic study groups that have started in Maine and other states to share information on homeopathic remedies. The groups can receive discounts on remedies. Although the participants were interested in discussing particular health care strategies that were successful, they all underscored the importance of sound animal management and prevention as insurance against health problems.

Christoph Meier commented that "healthy food and pasture are the basis of a healthy cow." This sentiment was echoed by the other producers, who agreed that sound herd management resulted in healthier cows. At Hawthorne Valley Farm, they believe health problems have to do with animals being stressed. The average cow age on conventional farms is 5 years old. Cows aren't fully mature until the third lactation, at 5-6 years old. The average age cow at Hawthorne Valley Farm is 7-8 years, with some that are 14 years old. Their herd average is 13,000 pounds, and they feel that "in order to be healthy, a cow could even produce less milk."

Earl Spencer has followed a similar philosophy. He targets milk production at a maximum of 80 pounds/cow/day, feeling that any more would have a negative impact on herd health. Earl feels that his herd health has dramatically improved with his new management system. Since he made the transition to organic management, he has seen a change in his lactation curve, for example. His herd average is 19,000-20,000 pounds and used to be 16,000 pounds. He commented that his cows are making just as much or more milk now, but they are making it more easily. Earl believes that using grain as a primary feed can cause a lot of stress, resulting in displaced abdomens and other health problems. His previous problems with ketosis, displaced abdomens and milk fever have all greatly decreased with a reduction in heavy grain feeding.

The Engelberts vaccinate all of their young calves and give them vitamins A, D, E and Selenium preventatively. Kevin attributes the low calf mortality to feeding whole milk. He feeds no milk replacer and hasn't lost a calf since 1984. Earl Spencer agreed that commercial calf starters with added antibiotics grow good calves but may tend to suppress the calf's ability to develop its own immune system. He found this after calves developed pneumonia-like symptoms after they were weaned and started eating non-medicated feeds. Now they only use whole milk and a homemade calf starter to bring calves along.

The major health problem that the Engelberts have had is mastitis, from cows that step on, bruise or bang their teats. If he has to treat, Kevin uses Today after stripping the cow out. Earl Spencer also uses Today for both lactating and dry cow treatment. He stated that the more you have to use an antibiotic, the more you kill off the good bacteria and create a sterile environment in the cow's udder. Neither farmer wants an antibiotic that will do this by staying in the udder for a long time, so they choose the product with the shortest time period.

Kevin remembered that in 1978, they had the vet to their farm every Thursday. They had a constant battle to get the cows bred and had a lot of mastitis problems. He decided that the use of agricultural chemicals and herd health problems were related. During the transition to organic management, they first cut back to bi-weekly veterinarian appointments and now they rarely have the vet to their farm. Kevin stated that even though there are fewer farms in New York, the veterinarians are hiring more staff, largely because of reproductive problems and monthly health checks. He feels that human health is definitely connected to the increased incidence of animal health problems.

Parasite Control

All of the participants were interested in learning more about the parasite cycle and potential parasite controls. The sheep producers noted that there is a much greater parasite pressure in sheep than cows. Christoph Meier identified that the problem rests in how we manage sheep. Whereas historically they were grazed all over the hillsides, now we confine them in small areas and feed them grain. We have taken the animal out of their natural environment.

Bill Kruesi believes the best solution for parasites is to put pastures into a rotation, where they are tilled up and reseeded every 5 years. He claims this will break the parasite cycle. He mentioned the following additional options for parasite control: graze the pasture with a non-worm host (different species of livestock do not share the same parasites); take the hay off or clip pastures; or wait a full year between grazings. Bill Kruesi explained that, "twelve months is the minimum length of time to break the typical grazing host-parasite life cycle. This is the length of time necessary to deprive free larvae of their host and for dormant eggs to lose viability from exposure. A 12 month rest from the specific host results in a "clean" pasture." Karl North prefers resting pastures for 12 months versus putting pastures into rotation, because tilling up the sod works against the goal of a permanent pasture. He cited the work of André Voisin who showed that permanent pasture will outperform pastures that have been in rotation, in terms of total bio-mass yields. Karl recommended starting lambs on land that has been hayed because it is the safest for vulnerable animals. He notes that a drawback to this approach is that it may require you to fence in your whole farm.

Bill Kruesi explained the host-parasite cycle. "The 1st through 3rd larval stages eat green grass. Eventually they are eaten by a host, where they mature into fourth-stage larvae and adults. The new adults lay eggs and the cycle continues." Once pastures are heavily infected, he noted, it takes a long time to clean them up. Kruesi has tried feeding his sheep diatomaceous earth (DE), added to his grain mix at the rate of 1-2% of the ration, or offered free choice with salt. He notes that this is an area definitely needing future research.

Christoph Meier said that biodynamic farmers look at parasites differently. They believe you weaken animals when you spread manure around because the animals are eating their own manure and will take up the parasites. Unhealthy animals or weak animals are likely to pick up parasites. Because of this, they cull animals that develop worm problems. As a preventative, Hawthorne Valley Farm feeds carrots to heifers to stimulate the nervous system for a healthy cow later on. According to Christoph, carrots and red beets also work well as a wormer. They use DE and wood ashes for grain parasites. They dust the DE and wood ashes over the top of their grain bin and mix it in.

Karl North uses a microscope on his farm to monitor flock parasite load changes, to see whether the parasite load is increasing or decreasing in his flock and to determine what has contributed to the change. Additionally, the monitoring helps him to identify the especially vulnerable animals that are the most responsible for high parasite loads in his pastures. He explained that he can identify key animals who are contaminating the farm and then cull them.

Dry Treatment

The decision to treat cows with antibiotics as they are dried off is a difficult one for a lot of organic growers. The organic certification standards in most states prohibit the routine use of antibiotics, preventing routine dry treatment. The risk of not dry treating cows is that they may freshen with mastitis. Several of the farmers discussed their different approaches to dry treatment.

Camilla Roberts noted that the decision to not dry treat their cows was one of the greatest challenges in making the transition to organic management practices. While conventionally managing their farm, they used to dry treat all of the bred cows and put them out on dry lot. In retrospect, she said she was not aware of the stress this was probably causing the cows. Committed to managing the herd organically, they had to re-work how they dried off cows and be more aware of their animals. They found that a more gradual drying off worked for them, and they did not have to routinely treat. They started by taking all of the cows' concentrates away, then milking only once a day, eventually reducing to every other day. Additionally, they kept the cows in the herd to watch them before sending them out to the dry lot. After adopting that strategy, they only had to dry treat chronic cases.

Bill Kruesi commented that protein in the animal's diet promotes milk, so Camilla's weaning the cows off concentrates is a good strategy. Bill explained, "if you wean the animals off protein, that is the best technique for drying off. You need to feed a lot of hay so that the animals are satisfied and this makes it easier to dry them off." The Lazors take their cows off high protein feed two weeks before drying off.

Karl North added that because sheep milk for a maximum of 6 months, drying them off without medication is easily done by passing over ewes in the milking parlor as their milk yield begins to decline more rapidly. He stretches the time between milkings, until milking can be safely stopped.

Alternative Remedies - homeopathy, biodynamic remedies, probiotics

As indicated above, the routine use of antibiotics is a prohibited practice in most organic certification programs. This standard has led farmers to experiment with alternative herd health remedies. The alternative remedies discussed at the forum were homeopathic remedies, probiotics, and botanical treatments (herbs). The principle "like cures like" forms the basis of both homeopathic practice and the word homeopathy; "homeo" means similar and "pathos" means disease. Homeopathy is believed to heal humans and animals by stimulating the body's natural defenses with minute quantities of disease-causing compounds. Probiotics are live cultures of beneficial microorganisms, such as bacteria or yeast, used to restore the normal population of microorganisms found in a healthy

individual. Herbal treatments are plant compounds that have been found to contain healing properties.

Peter Young and Jack Lazor rely primarily on homeopathic remedies for their herd health management. They have not used antibiotics for mastitis in the past 5 years, and have progressively learned more about the remedies and how they can be effective for treating a diversity of symptoms. The following are examples of how the participants have used homeopathic, probiotic, biodynamic or herbal remedies:

- Peter Young had a heifer with 5 teats. They cut the teat off and stapled it together. She ended up with a fever of 107.5°F. For high fever, he has had success using Belladonna every 15 minutes for 2 hours until the fever goes down. In this case, after 2 hours her fever had dropped to 104°F and by the next morning her temperature was normal (101.5-102° F).

- Peter uses Pulsatilla for cows that don't show heat, or don't come into heat—he gives 30C (dilution rate), once a day, for 21 days.

- Peter has calves who have developed grey, softish manure at 3-4 months old. He puts *Veratrum album* (30x) in their water and cleans their hind-end off every 12 hours. Within 24 hours, the symptoms have usually stopped.

- Bill Kruesi mixes up a combination of B complex, molasses and barley water or cooked, strained oatmeal for amino acids. This is given for ketosis prior to parturition in sheep. Camilla Roberts has had great success using the homeopathic remedy *Lycopodium* for ketosis.

- Christoph Meier uses a biodynamic remedy from Weleda for cows with digestive problems. It can also be used for hoof and mouth disease. Engelbert dealt with a digestive problem by giving a cow draft beer. The Lazors have tried Probiocin, a live microbiotic gel, to inoculate the intestinal tract of ruminants.

- Earl Spencer says older animals have an immunity to scours, and in younger animals, he will let it run its course. Engelbert agreed that if the calves are healthy, you can let it run its course. The Lazors feed yogurt for calf scours. They take 1 quart of raw milk hot out of the cow, put 2-3 T of yogurt in the milk and leave it in a warm place until the next milking. When they are ready to use it, they shake it, and put it in a bottle to feed out. They save 2-3 T to culture the next batch and give the rest to the calf.

Several of the participants commented on the importance of increasing the number of milkings per day and stripping the cow for mastitis control. The following other mastitis options were discussed:

- Christoph Meier has used an udder salve for a hard quarter before it gets serious. The salve is made of marjoram, lemon balm and calendula, extracted with alcohol, then boiled to get rid of the alcohol and mixed in with pig lard. The quarter is frequently milked out if necessary, and Lactovet (*Lactobacillus acidophilus*) is injected into the quarter. Christoph said they have also used clay packs on the udder.

- Jack Lazor has used Oil of Lavender mixed with thyme for E. Coli mastitis, sometimes used in conjunction with clay plasters (bentonite, oil and warm water) to draw out the infection.
- Kathy Morris has had very good results using garlic as a mastitis remedy. She feeds 7 cloves/cow at milking and a handful of wood sage, an herb recommended by Juliette de Bairacli Levy in her book The Complete Herbal Handbook for Farm and Stable. Kathy relies primarily on herbal remedies, preferring them to homeopathic remedies because she can make them herself.
- Immunostimulators, a colostrum derived product, are good for the immune system, used for mastitis, and on a weak calf or a cow with an infection. Anne Lazor has found that immunostimulators work best for strep. but do not work for staph. or coliform mastitis, although she has recently had good results making a staph. nosode (homeopathic treatment).
- For warts or sores on the teat, Camilla Roberts has used the homeopathic remedy Thuja. Peter Young has tried calendula salve, which he said gives some relief, but the problem often recurs. Bill Kruesi discussed a similar problem in sheep and goats. If it is viral, he recommends spraying with garlic, to prevent secondary bacterial infection. He also discussed the use of vitamin C as an anti-viral, giving 500 mg. for sheep and 2.5 grams for cows.
- Engelbert discussed a swelling above the foot in his cows, especially when the ground is wet and cold. The bacterial infection usually develops on one of the hind feet and the cow will eventually develop a fever. Bill Kruesi said that in sheep it is a sweat gland. If it gets plugged, it will abscess. He recommended running your thumb over the leg and caressing it.
- The Lazors use Nutralac, a tonic with minerals, amino acids and lactobacillus, if a cow is off-feed or has low energy. Anne adds epsom salts and vitamin C to Nutralac and gives to cows orally after calving and will sometimes add calcium or put epsom salts right in the water after freshening.
- The Lazors had a cow that had one quarter not milking when she freshened. The vet had reamed it out and put in a dilator, but it was still taking a long time to milk out. They gave her the homeopathic remedy Silica, which is good for scar tissue, once a day for one week. By the end of the week, the quarter was milking as fast as the others.
- Jack Lazor uses the probiotic ID-1 or Impro subcutaneously in the lymph system to give a cow antibodies.

Financial management

Marketing

Christoph Meier commented that we need more organization among the dairy farmers to be able to organize processing plants that would use the milk from 300-400 cows. Jack Lazor doesn't want to use negative labelling, but wonders how you create an image of wholesomeness and truth when other competitors advertise as wholesome, and they are not?

Bill Kruesi recommended that the Lazors use the image of themselves as family farmers, in contrast to other processors who buy from farmers. "We need to market as farmers and make this known on our packaging. This is more important than marketing organic purity. Consumers need a name to identify with when they buy a product, that is why many people are interested in community supported agriculture." The Lazors started their marketing with a CSA setup before these became popular, delivering cheese, butter, yogurt and raw milk to 25 families door to door. By 1984, they built a dairy barn, were licensed with the state and started delivering to food cooperatives and stores. Their primary product is yogurt, which they sell in four varieties: whole-milk, low fat, maple, and lemon. Jack notes that Jersey milk is good for processing. "At 3.8-4% protein, I can do a non-fat yogurt without adding whey or other fillers." If they have any surplus milk, they sell pints of heavy cream. Jack estimates that they gross \$224,000/year milking 25 cows. They used to reinvest their income into machinery or soil amendments, but now they are putting all of their earnings into meeting the Interstate Milk Shippers (IMS) regulations, including a filler capper machine for his yogurt, a cream bottling line, a second bulk tank and new recording thermometers.

Peter Young's marketing strategy is to "keep it as simple as possible," because "we want to put as much effort into producing good milk as possible." To get the word out about their farm, they have started a newsletter with feature stories about such things as grassland and rotational grazing, and hold an annual open house. They were interested in providing milk for a neighboring CSA, but found that few of the shareholders drink milk. His marketing challenge is how to best communicate with the consumer about their product. Now his product is just advertised as "pasteurized, non-homogenized certified organic milk." He feels strongly that homogenization changes the way our body processes milk, and that the food we evolved with is the healthier food. He assumes that people interested in health food are looking for the least processed foods.

Peter sells all of their milk they produce on consignment. The milk they don't sell is fed to calves or inoculated with yogurt and then fed to calves so they get more bacteria. They sell their milk wholesale for \$2.45/gallon, and it retails for \$3.19 a gallon. They figure that they receive approximately \$16.00 per hundred pounds for their raw milk. When asked about the economics of their operation, Peter commented, "we are not a model of success, we are a model of survival."

In 1993, Peter reported that he is in the transition to seasonal dairying. He sells fluid milk, and demand is greatest in November, December and January, but to use his pastures most efficiently, his cows should be dried off in February and freshen May 1st. Peter's milk market grows at 10 percent/year and he is getting \$3.39/gallon. He is considering marketing strategies which might allow him to dairy seasonally, use his pastures efficiently, and meet his market demand. For example, he is interested in diversifying into cheese production by making a distinctive Hill Farm Cheese.

Hawthorne Valley Farm, with its proximity to New York City, markets its products at the Green Market at Union Square on Saturdays, through its farm store and through a CSA. They process all of their own milk and receive an average price of \$18/cwt.

Earl Spencer noted that he could probably get more for his milk if he were to sell it as organic, but he explained that there are two reasons that he does not. First, he does not have the time, energy or money to develop a market just for his milk, even though he thinks there

is a market available. Second, he has written extensively in the past about the way he does things on the farm, and consequently has made a special effort to keep his methodology as pure as possible. He feels he will be more credible in arguing that farming using his methods is economically viable if his milk goes into the same tank as everyone else's. He hears that organic food costs more and cringes. He knows it may cost more in the store, but wonders if it really costs more to produce. Earl wants to prove, for himself, that he can produce milk and sell it the same way everyone else does by keeping his out-of-pocket costs low.

Bill Kruesi believes that "as organic farmers, we're holistic thinkers; organic is something we work towards, but will we ever get there? Organic farming is more of a way of life than a marketing label." He sells his wool to Pure Podunk (a business specializing in products for chemically hypersensitive individuals, now called Heart of Vermont) for .85/pound, in contrast to the .35/pound he could get on the conventional market.

Kathy Morris and her family rely heavily on bartering to supplement their cash income. The farm provided 70% of their income of \$13,000 in 1992 (this figure includes the value of barter). Kathy said that their gross sales are low, but their net income is relatively high because they rely on providing their own inputs, as much as possible, and bartering. They do very little organized marketing, relying instead on a small group of very loyal customers.

Regulatory Obstacles

Several of the participants shared their frustration with the regulatory requirements of the milk industry, many of which are obstacles for small-scale producers. Karl North talked about how few specialty cheese producers there are in the United States; most of the specialty cheeses are being imported from Europe. When he looked into what was limiting the production in this country, he found that the start up costs are extremely high when you have to meet all of the regulations of setting up a milk room, parlor and processing facility that will meet the specifications of the regulations. Karl recommended that there be different regulations for different scales of operation, and different lactating animals.

Among those regulations that the participants felt should be changed for organic producers are those limited or prohibiting the sale of raw milk. Peter Young feels that the regulatory bodies are concerned that they will get sued if a consumer gets sick. Russell Libby responded that it's ironic that the regulatory bodies do not appear to be afraid of a suit from a consumer using tobacco. Christoph Meier has run into problems selling raw milk in New York state, where the authorities are convinced that raw milk is dangerous. Christoph noted that on-farm processors of raw milk are inspected more frequently and must have lower bacteria counts, so raw milk is probably a superior product. Russell said that Maine still allows raw milk sales, but requires low bacterial plate counts. Massachusetts allows as much raw milk to be sold off the farm as a farmer wants, as long as the consumer brings their own bottle. Vermont allows a certain number of quarts to be sold off the farm. Christoph questioned whether the sale of raw milk could be raised as a constitutional issue. He recommended having a sign at the store or farm saying "this product is not pasteurized, buy at your own risk." After a thorough discussion, the participating farmers recommended that raw milk sales be incorporated into the national organic livestock standards.

The farmers agreed that the Interstate Milk Shippers (IMS) regulations also worked as a disincentive to small-scale on-farm milk production. They commented that there are a lot of small producers whose livelihood depends on crossing state lines, and there needs to be some reciprocity. Russell commented that each state should respect the other state's inspection. "For example, we shouldn't have to have Albany, NY send an inspector to Jack Lazors farm in Vermont to allow him to sell in New York." Jack gave an example of the inconsistency in the regulations; milk is allowed to be shipped into Vermont without the IMS certificate, but Vermont can not ship into New York without the IMS. Connecticut and Massachusetts, in addition, do not respect the Vermont and Maine inspections. Currently, it is all controlled by IMS, and the farmers felt that the IMS does not have sympathy for small-scale farming. Russell concluded that "for small farmers to ship inter-state, it is important for governments to recognize the inspections of other states as valid."

All of the farmers were interested in processing their milk locally, and they discussed ways to make this possible. Russell Libby said that we need clear goals of what we want to achieve. We need to define "raw milk", create standards for the production of raw milk, and work towards making it legal to sell. Christoph Meier warned that problems may arise from the new federal labelling laws, explaining that "it is in the interest of the big industry to keep it very standardized."

The participants also discussed regulations which proved to be obstacles to them in the area of approved dairy cleaners and sanitizers. Many of the farmers are interested in using hydrogen peroxide or other alternatives as a cleaner or sanitizer, as discussed previously, but it is not approved for use.

Proceedings of the 1993 Meeting

At the 1993 meetings, farmers shared an assessment of new techniques they had tried as a result of the discussion at the previous year's meeting. The results of these informal trials are described below. In many cases, the farmers' adoption of one new technique caused them to have more questions, and an interest in trying more new practices the following season. A list of the outstanding research topics and ideas are listed at the end of these proceedings.

At the end of the 1992 meeting, the participants prioritized the topics that they would like to focus on in 1993. The primary interest of the group was to discuss pasture management. Lisa McCrory, a pasture consultant from the University of Vermont, was invited to present information and to serve as a resource. Additionally, the participants wanted to follow up on their discussion of financial management in 1992, by reviewing the cost of production study that Russell Libby from the Maine Department of Food and Agriculture had completed in 1993. A summary of both of these discussions is presented below.

1992-1993 Field Trial Results

- Peter Young said that he is primarily interested in no-till, no-herbicide grassland improvement. He explained that he has a lot of Canada bluegrass (also called June grass) in his pastures which go to seed early and yield poorly; he would like to find something to

compete with Canada bluegrass without tilling and re-seeding. In trying to find something that would compete with these grasses, he tried overseeding orchard grass, but was not able to establish a stand. Many farmers agreed that they have had trouble with orchard grass because it often rots. Peter will try annual rye this year, although farmers in northern Vermont have not had much luck establishing annual rye.

Lisa McCrory recommended that Peter graze the areas with a lot of Canada bluegrass first, to keep the grass short and well managed. Canada bluegrass goes to seed when it is 8" high, so farmers who want to control it must intensively manage their pastures and keep the grass short. Lisa recommended that Peter could also try broadcasting a variety of grass that he wants in his pasture early in the spring, and it may compete with the Canada bluegrass. She suggested Kentucky bluegrass, which is in the same family as Canada bluegrass but has wider blades.

Peter is currently experimenting with feeding hay in the early spring to his cows on the June grass section, hoping they will stomp it down, and encourage new growth. He will also broadcast seed Kentucky bluegrass, fescue and red clover to try to establish grasses and legumes to compete with the Canada bluegrass.

- Peter Young took Earl Spencer's recommendation to interseed brome grass with alfalfa. Earl explained at the 1992 meeting that brome grass can compete with the alfalfa because it also has rhizomes. Peter tried seeding metua (a kind of brome grass) with ladino clover in 1993, and it winter killed. Peter thinks it may not be hardy in his northern climate.
- At the 1992 meeting, Christoph Meier recommended heating manure only once, so that the manure will maintain more of its fertility value. Peter Young has always heated the manure, turned it and then heated again before spreading on his fields. He usually spreads the twice heated manure after his first hay cutting, and has noticed that the manure would just sit on top of the grass and not incorporate very quickly. In 1992, he spread his manure before his first cutting of hay, without turning it, and had good results. He was concerned that if he put the manure on before first cut, he would pick up the residue in the hay, but found that although they sometimes pick up some manure/bedding residue, it was not a significant problem. Peter commented that a spreader with good beaters will help the manure break down more quickly.
- Camilla Roberts tried using pigs as a rototiller in one of her gardens. She put two feeder pigs in a 25' x 45' plot and they did a great job breaking it in. She is planning on rotating the pigs through every third year. She learned that because pigs are not ruminants, they carry some of the same worms that humans are susceptible to, such as round worms. She stressed the importance of parasite monitoring, or growing crops which the parasite eggs will not transfer to, such as corn. If you plant root crops or leafy crops, there is a risk that the eggs will end up on the vegetables.

Kathy Morris reported that she is using her pigs for pasture improvement, primarily to root out moss and blueberries. She runs them on scrub ground for 6 months and then either plants buckwheat or leaves the ground open. The field goes back to pasture, with nice stands of white clover. Since Kathy has started feeding the pigs alfalfa waste from her sprout business, she has also seen alfalfa coming into her pastures.

•Camilla Roberts tried using geese as weeders for strawberries. She put 3 goslings in a 70'x40' area and 2 goslings in an area 30'x15' in mid-July. Camilla expected that the geese would eliminate the weeds in the strawberries, with the goal of getting their first year crop of strawberries as weed free as possible. She found, however, that they only forage on weeds, and do not uproot them, so she had to manually weed. Camilla noted that the geese did do a good job of controlling chickweed, a weed that she has had a difficult time eradicating.

•Karl North tried a new cleanser, calcium carbonate (Arm and Hammer baking soda), on his dairy equipment and animals, based on the discussion of cleansers in 1992. He found that it worked better than detergent and was easier on his hands and the sheep's udders. He is interested in trying hydrogen peroxide as well.

•Karl North is experimenting with inter-breeding Texel, a Dutch sheep breed, to get a breed which is purportedly better on pasture and which has fewer parasite problems in lambs. He has not seen any milking results yet, but said that his lambs had better parasite resistance on grass and grew as well with less grain. They received no grain after their first 2 months of growth and no milk after 30 days. He noted how long a process it is to work on genetic improvements in a flock.

•Karl North reported that a \$5.00 extension cord reel worked well for a polywire fence reel instead of the \$35.00 models in the electric fences catalogue. He said you have to rig on a hook so they can be hung from the permanent fence and then they work fine.

•Jack Lazor reported that he underseeded mammoth red clover in his corn in early July. When he went back through with his disc hillers for the last cultivation, he had a helper sitting on the tractor with a cyclone seeder, spinning the clover seed on at the rate of 20 pounds/acre. He hypothesized that this worked better than walking the rows and broadcasting the seed because the seeds were being slightly covered after planting, giving him better germination. The clover did extremely well, and he sees it as a potential feed source, but was not able to feed it this year because the corn picker ruined his stand. Russell Libby added that some growers in Maine have had success interseeding crimson clover. He explained that the benefit of the crimson clover is that it winterkills, so a farmer can plant back into the residue.

•Jack Lazor experimented with a longer season soybean this year. He seeded them in rows with a corn planter versus a drill and found that they did not mature as well. He believes the grain drill is better because the planting is more concentrated, the plants are smaller and therefore will mature faster. In retrospect, he thinks he should have chopped and ensiled them and questioned whether he should have mown them early to get a concentrated pod set.

•Jack Lazor experimented in 1992 with stockpiling a pasture, leaving one pasture to grow so that he could use it for longer grazing in the fall. He left all of his bred heifers and dry cows out on pasture for 3 weeks in October and November and found that they did well. The pasture was not high enough quality for his milkers, but there was ample feed for his heifers and dry cows.

•Camilla and Silas Roberts developed a way to store long hay haylage for small-scale growers who want to winter feed grass silage to their ruminants. In 1992, they tried Peter

Young's black plastic envelope technique, but found that most of the haylage rotted because it did not have a high enough moisture content. In 1993, they were able to produce a high quality silage for their diversified herd. The following recommendations are from a review Camilla wrote of their trial.

The grass must be cut very young and packed in a pile at a high moisture level. Therefore, cut it when the grass is no more than 12" long. If the grass is too mature, the stems will become hollow and stiff making it impossible to pack sufficient tightness to eliminate air in the pile. Mow the grass in the morning, and do not ted, condition or crimp it. If you want to rake, do so just prior to picking up the grass. In the afternoon, pick up the grass and pile evenly, a foot or more deep for each layer. Pack it well by driving or rolling a heavy weight over the pile, such as a tractor or truck. Squeeze as much air out as possible. Cover the pile each day with a vapor barrier such as black plastic. Put tires or sand across the top to hold the plastic tight on the surface of the pile. Making a bigger pile is more advisable than a smaller pile. Ideally, add new grass daily, or try to continue adding to the pile with as little time between layers as possible. A certain amount of rot will occur, especially around the edges and across the top where it is exposed to the air. After you have added all the grass you want, cover the pile and apply tire or sand evenly.

After 3 weeks, the micro-organisms inside have consumed all of the available oxygen and have created a highly acidic environment which kills them off. At that point, the grass has been pickled, and will stay preserved until air is again available. When feeding out the pile, plan to feed a strip of the grass silage every day so as to prevent further composting action. Keep the face of the pile clean and sharp to avoid spoilage. Without a chopper, they have found it necessary to put the grass in wetter so as to pack it while it is still soft. The silage they cured was somewhat sour, but still of relatively high quality with only a small portion spoiled.

1993 Puna Chicory Field Trial

Karl North received a federal Sustainable Agriculture Research and Education (SARE) grant to establish puna chicory in his pastures. He said he was attracted to puna chicory because it seems complementary to other species growing in his pasture. He described that "puna chicory is like having a perennial brassica. It produces up to 12 tons/acre and the quality of the forage and palatability exceeds almost all other plants." He explained that the puna chicory has a deep taproot, which brings up minerals from the soil profile. It is high in potash, calcium, zinc, manganese and iron, and tests at approximately 30% protein. Karl added that a significant benefit is the increased animal weight gain, with up to 15%-100% increase in weight gain over a rye grass/clover pasture. Accordingly, milk production is higher. This is linked to the water uptake of the feed. Karl said that "it is hard to get water into sheep. Using a brassica-like grass gets water in to the animal without them having to drink it."

Chicory has been recognized for centuries in Europe as a high quality perennial forage. Puna chicory was developed in New Zealand as a forage equivalent to alfalfa in protein, but surpassing alfalfa in minerals, vitamins, trace elements and above all in palatability. Because of the deep tap root, puna chicory grows well when other forages succumb to summer drought. Recent trials in the United States have drill-seeded puna chicory for a temporary forage rotation. They believe chicory has potential to play a

significant role in a permanent forage system by overseeding chicory into a permanent hay pasture sward.

In early May, 1993, Karl overseeded two different rates of puna chicory into relatively poor soils that had been improving over the years due to intensive grazing management.

Karl did four different trials:

1. overseeded 2 lb./A and kept the sheep out of the pasture
2. overseeded 2 lb./A, and had the sheep graze to trample in the seed
3. overseeded 4 lb./A and kept the sheep out of the pasture
4. overseeded 4 lb./A and had the sheep graze to trample in the seed

Results: Karl had germination only where he seeded puna chicory at the rate of 4lb/A and the sheep trampled in the seed. He measured "satisfactory germination" if there was 1 plant established/4 square feet. The stand he seeded into was redbud orchard grass, perennial rye grass, birdsfoot trefoil, red and white clover. The legumes made up 50% of the total forage.

The puna chicory was 8" tall by late June, growing well in both the trefoil/grass stands and the clover/grass stands. Karl found that the germination was heavier in the bare spots, and hypothesized that the sod must be inhibiting germination. Given this, Karl recommended that the pasture be grazed down the previous fall as low as possible, so when overseeding, the puna chicory seed has more chance of contact with the soil.

Karl is interested in the relationship between the soil fertility and establishment of puna chicory. Karl noticed that the germination was heaviest at a bare spot underneath a tree in his pasture where the sheep drop a lot of manure. The chicory grew relatively slowly in the first year of the trial in relatively unfertile soil, compared with the control plants in his garden which grew twice as big. He wondered whether the growth in both examples was due to the increased fertility or lack of competition.

Next year, Karl will continue the trial. He will monitor the seeding to see what grazing management or grass mixes will lead to a perennial chicory stand.

Pasture Management

At the close of the 1992 livestock meeting, the participants agreed that they wanted to return in 1993 to focus on improving their pasture management. Topics of particular interest were: improving the quality of pastures without tilling, increasing the food value of pastures, and stockpiling pastures for fall grazing. Lisa McCrory, pasture management outreach consultant from the University of Vermont, discussed the following guidelines for intensive rotational grazing:

Pasture Height

Lisa recommended putting animals out to graze when the pastures are 6" high, leaving 1-2" behind, or leaving 2.5 " and having other animals come in to clean up the pastures. She does not recommend putting animals in a pasture with grass higher than 8" (for cattle and horses, 3-4" for sheep, goats, pigs and poultry.) Lisa explained that "when cows graze at 6", they can graze a mouthful, they can take more bites per minute, and take

less time to chew. If they graze higher pasture, it takes the animals more effort to chew it down, and they will not eat as efficiently." Additionally, the grass that gets left behind will get coarser and the cows will not graze below it. It is important to leave enough stubble to keep the soil cool, especially if there is a dry spell.

André Voisin recommends grazing down to 1/4-1/2", but in a book entitled *Agriculture, The Only Right Approach*, P. H. Hainsworth recommends leaving a longer stubble, similar to when grass was cut with a scythe. Lisa explained that it is the same principle as cutting the lawn: if you cut your lawn too close, it may develop diseased or dry, burned spots. The amount of stubble left after grazing and the rest period depends upon the predominant grasses in the pasture. Lisa explained that all of the seeds we need for good grazing are in the soil. She recommended mastering our current forages before we add new ones, explaining that only certain grasses can handle intensive grazing, and farmers can improve their pastures by sound management of the existing forages. The challenge to the farmer is to create the opportunity for those seeds to come up. For example, if you want to have a primarily orchard grass stand, you would discourage low growing sod grass, like Kentucky bluegrass and a proliferation of white clover, by leaving a higher stubble (approximately 4"). If you want a Kentucky bluegrass and white clover stand, graze lower, giving the plants the optimal conditions to grow. Lisa summarized that the amount of stubble you leave is dependent on the kind of grasses you want, what is already in the stand, and what you want to favor.

Lisa underscored the importance of giving pastures the rest they need. Depending on the pasture and the weather, a general guide for resting pastures is as follows:

- in May and June, rest pastures 10-15 days
- in June and July, rest pastures 20-25 days
- in August and September, rest pastures 30-40 days
- in October, rest pastures 50 days

Lisa emphasized that these are just general guidelines, and that the rest period will depend upon factors such as the quality of the pasture, moisture, and number of animals grazing. She stressed that farmers have to adapt everything to their own conditions. Karl North agreed that the important factor is knowing your pastures, and making decisions about the rest period based on what is growing and how tall the grass is. "Pasture management needs to be holistic, day-by-day management."

Peter Young also stressed the importance of the recovery period when grazing. He said that "grasses and clover create their bank account by sending up their solar collectors, capturing energy from the sun and storing it in the roots. When grass is harvested, you are borrowing from the bank, and it will take more regrowth to replenish your bank account. The important thing to remember when managing pastures is 'don't starve the bank account.'"

Pasture Design

Fencing: Lisa said there are many considerations to take into account with fencing. It is important to have a good perimeter fence, it is important to have a good charge and farmers must consider the cost of the different kinds of fence.

Pasture lay-out: When designing paddocks, Lisa said it is important to think about the following factors:

- Gateways:** Cows will stand in the corner of the paddock closest to the barn, so this is an important place to have a gateway.
- Alleyways:** Well designed alleyways are important. They should be as big as the biggest piece of machinery you will need to get to the fields (8-10 ft.), or large enough for animals, if no equipment will be used (5-6 ft.). If alleyways are too wide, potential feed is wasted. Lisa recommended making permanent alleyways to reduce the labor involved in moving fencing.
- Slope:** The slope of a farmer's paddocks can have an impact on both the quantity of feed produced and how well the animals graze. A north facing slope, for example will not grow as quickly. If you are on a hill farm, Lisa recommended isolating the slopes, to graze just one at a time whenever possible. Otherwise, if you have sloped land and flat land, the animals will always lie down on the flat ground and deposit all of their manure there.
- Shade:** Allowance of shade is a controversial topic. If you give animals shade, they will use it. If they spend time lounging in the shade, it will take away from the time they may be eating. Additionally, most of the manure will collect in the shade and not be evenly distributed around the pastures. The need for shade often depends on the herd, but it is possible to create a heat tolerant herd. She said it is good to remember that on a hot day, cows will drop in production whether they are in the shade or not. Karl North has found that in the heat of the day, his sheep will not eat, whether there is shade or not. He brings them into the barn and gives them good hay in the heat of the day, and then he puts them back out again on pasture. Karl said feeding hay can be especially important early in the grazing season to keep fiber in the sheep's rumen.

Lisa recommended that farmers look at an aerial photograph of their farm and map out on paper the ideal lay-out of their paddocks, giving consideration to slope, water courses, and shade.

Water systems: Lisa reminded the participants that it is important to give your animals the same quality water you would drink yourself. If they have to travel to go and drink, they will hang out at the trough, leave their manure there, and may not get back to the pasture to eat. Additionally, if the water tub is a long way away, the submissive animals may never get water. Having water in the paddock reduces the stress level and the social hierarchy of the animals.

Karl North said that he saw an immediate difference in his sheep drinking when he purchased a new, galvanized tank. He used to have an old, rusty tank. He has both in the field, and they always drink out of the newer tank first. He wondered whether the fact that the sheep can see the bottom of the tank makes the difference in their drinking or whether the rust causes the water to be off-flavor.

Paddock size: Lisa recommended that paddocks be small enough so that animals focus on their grazing. "If they have too much to choose from, they wander around and focus less on grazing, but a large number of animals in a small area will concentrate better and waste less

feed." She recommended being attuned to the behavior of your animals in a paddock, and checking them during the day. "If they start yelling at you, try to figure out why."

A pasture wheel or pacing can help determine the size of the paddocks. Lisa said that most people just make rough estimates, but if you want to know how much your animals are getting to eat, you can measure the paddocks. A general rule of thumb is to stock 50 cows/acre/day (43,560 square feet = 1 acre.) On average, paddocks give 1,000 lbs. of dry matter/acre grazing at 6". Cows can graze 30-40 lbs. of dry matter/day, although most people figure on 20 lbs. of dry matter/day. Peter Young said he wants to try making his paddocks a little bigger and not letting his grass get as long. He said that his pastures are measuring 2.5 tons of dry matter/acre. If the average pasture measures 3.5-4 tons of dry matter/acre, he would like to improve his pastures.

Although the standard numbers are a good general guideline, Lisa and several of the participants stressed that farmers have to be flexible and work with what they have; the rules will not apply to every situation. It is important to see what the cows are grazing in the pastures, and how they are milking--that is the best way to determine if they need more or less feed.

Measuring Feed Availability

Farmers who are interested in measuring the productivity of their pastures, and the feed value, can take forage samples. Lisa takes samples by grabbing forage randomly, as cows would graze, and bagging it. From 497 forage samples in 1992, they found an average of 23.8% dry matter, 24% crude protein, 20.5% available protein, 69.2% total digestible nutrients, 1.13 mega calories/lb. of metabolizable energy, .72 mega calories/lb. of net energy lactation, and an average dry forage yield of 3.5-4 tons/acre.

The Profitability of Intensive Pasture Management

The University of Vermont Pasture Outreach Program has started working with farmers on doing a farm enterprise analysis, in part to determine the economic costs and benefits of pasture management. Both *Stockman Grass Farmer* and *The Pasture Prophet/Profit* have also done detailed economic studies of grazing, and are helpful resources (see references).

One expense that the Pasture Outreach Program is tracking is the difference between feed costs in winter and during the grazing season. The winter feeding assumes 6 months feeding a winter ration of corn silage, haylage, hay and grain fed in the barn. The savings of feed during the grazing season in 1992 were \$13,200 for 62 lactating cows and 15 bred heifers. This allows a farmer to compare what the cost would be if the animals were fed in confinement all year and not grazed. This helps to evaluate the value of pasture. One farmer realized a savings of \$233 per cow for 55 cows.

Many farmers in the Pasture Outreach Program are also interested in the costs and benefits of seasonal milking. Seasonal milking is attractive because many of the jobs become synchronized and more efficient, the farmers get a relief from milking for part of the year, and if they are planning on spring freshening, they can maximize their use of pastures. A potential drawback of seasonal milking is that farmers will not have a constant supply of

milk; this is especially a consideration for farmers who do their own processing. Lisa said that a change from milking for 12 months of the year to 10 months of the year has decreased the costs of production on some farms. She commented that this may be a particularly good strategy for farmers in the Northeast, given that the return is limited and farmers should adopt the practices that will help them cut their production costs.

Trouble Shooting - questions and discussion

- How can I begin to incorporate rotational grazing?

Kathy Morris would like to begin rotationally grazing more systematically. Lisa recommended that she start with as many paddocks as possible. The shorter the time that animals are in each paddock, the better. If pastures are not given enough rest, and regrowth is eaten prematurely, energy will be drained from the roots of the plant. After the animals have cycled through the pastures twice, mow the pastures if they are undergrazed. Otherwise, rejection areas will begin to accumulate and you will lose grazing area. Lisa said that mowing can be helpful when you're getting started and the pastures may get ahead of your rotation. The mowed forage can be put up as hay, or cut and left for animals to eat in the pasture.

- What do weeds in my pasture indicate?

Lisa explained that weeds are an indicator of different conditions. Dandelions, for example, have good feed value. They test at 20% crude protein, but don't yield well. Vaughn Jones, New Zealand pasture consultant, thinks that a lot of dandelions indicate calcium deficiency. He recommends that farmers lime their soil for the benefit of gaining calcium, as much as correcting pH. In contrast, Karl North found that on his farm that he had more dandelions when his calcium tested higher. He has found that once the alfalfa gets high enough to shade out the dandelions, they are not a problem. Buttercups are often a sign of undergrazing. They are toxic and non-palatable to animals when mature. If you have a proper stocking rate, the buttercups will not make it to a non-palatable stage, and the animals will eat them when they are young.

Camilla Roberts said that they have a lot of milkweed in their pastures, a weed which is toxic to animals if they eat it when it is wilted. Once the milkweed is totally dried, it loses toxicity. They have seen less milkweed since they began using boron. The toxicity of wilted versus dried plants also applies to all fruiting trees (e.g. apples, cherries), so animals should not eat the wilted prunings. The symptoms of toxicity are frothing at the mouth, rolling eyes and walking in circles. Camilla said that potassium nitrate is an antidote if an animal is showing signs of toxicity.

Camilla's reference to boron reminded many of the Vermont farmers of Fred Franklin, revered soil consultant of many northern Vermont growers. He said that boron was the key to keeping orchard grass sweet enough to be palatable. He recommended 20 lbs./A of Borate 40 (14% elemental) = 3 lbs. of elemental Boron/acre. For alfalfa, he recommended 60 lbs./acre. Fred Franklin also said that red clover leaves should be round versus oval. He maintained that low sulfur creates narrow leaves, and recommended that farmers use sul-po-mag to maximize the growth of their clover.

- What is the best way to incorporate Kentucky blue grass into an existing stand?

Peter Young wondered whether a no-till drill would work. Lisa answered that the seeds may be too far apart to establish a good stand, but that she hasn't researched the best way to seed Kentucky bluegrass. She doesn't like the idea of turning over the soil, believing that every time you till, you disrupt the balance of the microorganisms. She cited the work of André Voisin, who looked at the stability of older pasture versus newly established sod. The older pasture (e.g. 40 yrs.) held moisture better in a dry period than 2 year sod because it had a better sod base.

The participants agreed that this question would be a great research topic, and they discussed potential trials including:

-broadcasting the seed in the early spring when the ground is wet and having the animals work it in.

-seeding grasses through manure. If a farmer puts seed in their feed grain, the cow will seed the grass as it grazes, or it will get incorporated into the manure pile and spread.

Outstanding questions were: what happens to clover or grass seed when it goes through a cow's gut? If seeds go through a light composting process when the manure is stacked, will they be killed? Karl North said that he has fed trefoil seed to his animals and then moved them around to spread the seed with their manure. It is not a true perennial, so he is seeding it every few years. As the fertility comes back to his farm, his success with frost seeding has increased.

-frost seeding Kentucky bluegrass. Will you get better germination with frost seeding, because the seeds may end up under a clump of manure? Karl North said that he had success frost seeding perennial rye, but Jack Lazor did not. Karl said that recent trials by Daryl Emmick of the New York Soil Conservation Service has found that rye grass is not a true perennial, so it is not being recommended for a perennial stand.

- Does overseeding of grasses work?

Vaughn Jones, New Zealand grazing consultant, recommended overseeding annual rye in the spring (Lisa estimated at 10 lb/acre), when you see the first green grass. He recommended seeding puna chicory at the same time, at the rate of 1 lb./acre on established sod.

- What are the benefits or drawbacks of herbs in pastures?

Camilla Roberts said that Farm and Wilderness has areas of established tansy and comfrey and the animals are very drawn to the comfrey. She questioned whether it would be good to establish comfrey in an area that animals would get a little every day, citing the old adage that "comfrey every day is like an apple a day." The Henry Doubleday Research Association in England has done a lot of research on comfrey. They recommend comfrey as a good feed source (24% protein); it's easy to establish and it recovers well from being grazed. Kathy Morris said that she tethers her cows near comfrey and the older cow goes to it first. She mentioned that they also like plantain. Kathy recommended the book Fertility Pastures, written by Newman Turner, and published in the 50s, which contains a lot of information on seed combinations for pastures.

- When we switch over to grazing, the manure gets very loose. Should we be supplementing their diet with hay when the pastures are lush?

Lisa noted that animals need a certain fiber mat in their rumen. If feed is too lush, they will not have enough fiber, and you might want to feed 1-2 lb. of hay.

Cost of Production

In 1993, Russell Libby completed a cost of production study for dairy farming. At the end of the 1992 meeting, participants agreed that they would like to further discuss milk pricing, regulatory issues of milk marketing, and the cost of production for their products. Russell Libby led the group in a discussion of these issues.

Background

Maine regulates prices at all levels (price paid to farmer, wholesaler, and retail price) for Maine-produced milk sold in Maine. Producer prices had been set at prevailing regional prices (federal order 1) until a drought struck in 1989, grain prices went up, and Maine added a dollar to producer prices for fluid milk purchases. The Department of Agriculture could not maintain this because retailers threatened to buy milk from Massachusetts dealers. In 1992, the Maine legislature passed a vendor fee, between the dealer and the retailer, setting a variable fee that insures farmers at least \$16/cwt. (hundred pounds of milk) for fluid (class 1) milk. But producers said that no one had done a producer cost analysis for many years, so the Maine Department of Food and Agriculture asked Russell to complete a study.

Summary

Russell wrote and sent out a comprehensive cost of production survey to 150 randomly selected farms and received over 90 good responses. The farms averaged 981,000 lbs. of production from 60 cows. Production costs, using figures from the IRS schedule F, averaged \$14.70/cwt. across the sample. On a volume-weighted basis, with larger farms weighted more heavily, that fell to \$14.17/cwt. This compares to a 1991 blend price of \$13.80 in Maine, and a typical dairy-related income of \$14.68 with cull cow sales included. When alternative measures of production costs are calculated that include a return on the farmer's equity in the dairy farm and a payment for unpaid labor, almost all farms show a negative return. Averages for these measures ranged from \$20.67/cwt. to \$22.50/cwt, with volume-weighted averages of \$17.56/cwt to \$19.10/cwt.

Russell found that the labor issues and the money that the farmers live from is the most telling. He found that most families are living from their depreciation on capital. But if a business is going to be successful in the long term, you have to have a return on those assets. The USDA estimates that farmers get about a 3% return on their assets. In comparison, food manufacturing firms get a 19% return on their assets.

Russell's study of unpaid labor, including the hours that the farmer and family members work without pay, found an average of 1.6 unpaid workers per farm. To estimate the value of this labor, Russell assigned a value of \$6.00/hr, capping the labor costs at \$1500/cow. He found in general that small farms were using more family labor than larger farms, which more commonly hire labor and record it as a cash expense. Each unpaid worker averaged 42 hrs./wk. in the winter and 55 hrs./wk. in the summer. Russell's study

showed that farms were relying the equivalent on \$4.76/cwt. in unpaid labor across all farms and \$2.64 volume weighted. Russell displayed a graph showing price of milk/cwt. versus size of herd. In general, the graph shows a cluster of competitive farms that are in the 40-50 head size. Some of the larger farms have below average return, and some are above average. Similarly, some small dairies with low production levels are getting as high a return as some bigger producers.

After reviewing his results, Russell is concerned that the statistics might encourage dairy farmers to look only for a higher return on their investment. With this as the primary goal, farmers are faced with a choice of increased production or decreased production costs. Other goals, however, may be important, including reducing unpaid labor and reducing the practice of living off of depreciation. Russell feels that the best measure of the profitability of an operation, not just its profit margin, is the return on equity.

Karl North responded that profitability is the whole net income. Farmers decide on their net income based on how much profit margin they decide to take. He stated that economists define net income as split into two parts—return on equity and annual profits. But the reality for farmers, he believes, is that they can not define it in two parts. "Farmers decide whether they take the profit as a return on investment, a return on labor, or a combination of the two. From the farmers' view, once I take a reasonable wage, how much do I have left over for a return on my equity? Usually nothing." Karl concluded that, "a return on investment and profits are not cast in concrete—economists should not talk as if you can point to something and say 'this is a return on equity.'"

Economies of Scale

The participants finished the forum with a discussion of economies of scale and what scale of farming they are most satisfied living and working. Camilla Roberts started the discussion by recounting the patterns she saw when they were farming in Wisconsin. Farms were handed down to you by your family, and there was a pressure to make technological changes, buy the neighbors' land to expand the farm, and set yourself up as a corporation with each family member specializing in one aspect of the farm. She said that farmers were making money for a while, but the fixed cost of debt ran their lives. When land prices fell, they were devastated financially. She said that organic farming draws people who are interested primarily in small scale, pay-as-you-go mentality. But once you have to invest in capital, as Jack Lazor did to meet interstate milk shipping regulations, you have to milk more cows to justify your capital expenditures, and all of a sudden, you are at a different scale than you idealized.

Camilla used Kathy Morris' operation as an example of a functional, small scale farm. Kathy relies primarily on a steady group of customers to support her farm, and she keeps her costs low. Karl North echoed her comments, noting that the reason he has gravitated to a small scale is to "protect myself from the one-up-manship of scale. We are small enough to have a local clientele, we are small enough to educate the community to move toward a healthier food system, and we are small enough so that people can support us. We are not a CSA, but we have a similar arrangement with 100-200 people in the local area."

Many of the participants discussed how their scale is linked with their quality of life. Karl North feels strongly about getting out every Friday night to play music as a way to

relieve his stress. He said that they had to figure out what the cost in production loss was from his being away during milking time, but decided that it was marginal and very worthwhile. Camilla commented that "farms and farming have become an isolated practice, like a commodity. We need to expand our vision of farms to include land-trust models, and educational facilities that incorporate farming. Since farmers are only 2% of the population and don't have time to leave the farm to advocate for farm issues, we need to look at these other avenues to help connect non-farmers with farmers." At the end of the forum, the farmers wanted to continue to pursue the concept of "appropriate scale." "We can work on determining the scale, instead of letting the scale make decisions for our farm. As organic farmers, we need to define this now."

Future Research Topics and On-Farm Experiments

- Peter Young is interested in feeding cows in the winter on the pasture by putting a round bale in pastures where the soil is marginal. Peter anticipates the following benefits: an increase in organic matter in the soil, the seed heads may improve the surrounding pasture, the hay would be easier to feed out, they would not have to spread manure, and they would save money on bedding. He wonders whether or not he would lose the benefits of the manure and urine in the snow, and how this practice would differ from winter spreading.

- Camilla Roberts is interested in seeding typhon in alternating strips with sod. Strip cropping with sod, she explained, prevents the pasture from getting too muddy and helps prevent the animals from getting diarrhea from a brassica diet. Karl North suggested puna chicory, since it has equivalent feed value of a brassica (or better) and it is a permanent stand. Camilla believes that typhon needs garden conditions (tilled land) to germinate, after having poor luck trying to establish it in her pig pens in 1993.

- Jack Lazor wants to try a pasture renovator, an aerator, to improve his pastures. He said that the soil and water districts may purchase one and rent it out. Lisa McCrory responded that the heaving in the spring is enough of an aerator; experiments done by the University of Vermont on both clay and clay loam found that an aerator did not improve the pastures.

- introducing new grass species by frost seeding
- the value of compost for different crops, and its value when aged for different time periods.
- planting garlic or another allium in pastures to inhibit parasite build-up, especially in lambs.
- alternative parasite remedies, including Shaklee's Basic H and garlic.
- mineral content of forages – do farmers need to supplement?
- vitamin differences in organic and conventional feeds.
- efficacy of diatomaceous earth in controlling nematodes and for fly control in manure.
- effectiveness of hydrogen peroxide as a cleanser, sanitizer and teat dip.
- fact sheet for on-farm pasture seed trials
- alternative, winter-hardy crops for New England
- manure storage and handling -- how to best collect liquids?

References

Alternative Herd Health

- Boehncke, E. 1990. "Some Basic Principles of Organic Animal Husbandry." *IFOAM*, No. 10.
- Boehncke, E. and C. Day. 1985. "Vet's trials help prove homeopathy." *New Farmer and Grower* No. 9 (Winter). Available from British Organic Farmers, 86 Colston Street, Bristol BS15BB Great Britain.
- Brusko, M. 1985. "A Belly Full of Bacteria." *New Farm*, September/October.
- Buchanan, P. 1991. "Doc Johnson: A holistic approach to herd health." *Synergy* (Fall).
- Day, C. 1991. "An Introduction to Homeopathy for Cattle." *New Farmer and Grower* (Summer).
- Day, C. 1993. "Homeopathy Questions and Answers." *New Farmer and Grower* (Fall, continuing quarterly).
- Halliday, G. 1990. "Animal health and the organic livestock producer." *New Farmer and Grower* (Autumn).
- Kruesi, W.K. "Natural Health Care for Farm Animals." RD1, Box 549, Wallingford, VT 05773.
- Mate, J. 1985. "Homeopathy: a vital step in the necessary changes to our livestock systems." *New Farmer and Grower* (Summer).
- Stewart, C. 1985. "Breeding--a fresh look is needed." *New Farmer and Grower* (Winter).
- Tritschler, J., L. Semprevino, and D. G. Fenton. *Parasite Control Series*. Department of Veterinary and Animal Science, University of Massachusetts, Amherst, MA 01003.
- Woodward, L. 1984. "Homeopathy offers a safe alternative in livestock medicine." *New Farmer and Grower* (Summer).
- Woodward, L. 1983. "Alternative medicine offers hope for mastitis problems." *New Farmer and Grower* (Winter).
- Younie, D. 1990. "Organic beef in perspective - A comparison with conventional methods." *New Farmer and Grower* (Winter).

Forage/Grain Production

- Agri-View*. 1992. "The New Dairy Grazing." *Agri-View* (February), 700 E. State St., Lodi, WI, 54990.
- Bowman, G. 1992. "Sweeps, Shields and Shanks to the Rescue." *New Farm* (March/April).

Cramer, C. 1990. "Grass Farming Beats Corn." *New Farm* (September/October).

Gage, S. and S. Smith. 1989. "The Moore Dairy Farm." *American Journal of Alternative Agriculture* 4(1).

Gunsolus, J.L. 1990. "Mechanical and Cultural Weed Control in Corn and Soybeans." *American Journal of Alternative Agriculture* 5(3).

Hanes, J. 1986. *Enterprise Analysis of Michigan Dairy Operations: Utilizing Seasonal Calving and Controlled Grazing*. Dept. of Ag. Economics, Michigan State University (June).

Jones, C. and P. Burns. 1988. *Economic Effects of Adoption of Rational Grazing*. Soil Conservation Service, Orono, ME.

Koepf, H. 1993. *Forage based farming, manure handling and farm composting*. Bulletin #4. Michael Fields Agricultural Institute, East Troy, WI.

Murphy, W.M., J.R. Rice and D.T. Dugdale. 1986. "Dairy farm feeding and income effects of using Voisin grazing management of permanent pastures." *American Journal of Alternative Agriculture* 1(4).

Nordell, E. 1992. "Crop Rotations" *NOFA-NY News* (Part 1, Jan./Feb., Part 2, March/April). PO Box 21, South Butler, NY 13154.

Peters, S. 1991. "10 years Without Herbicides." *New Farm* (March/April).

Sheaffer, C., et. al. 1993. *Forage Legumes: Clovers, Birdsfoot Trefoil, Cicer Milkvetch, Crownvetch, Sainfoin and Alfalfa*. Minnesota Ag. Exp. Sta., Bulletin 597-1993, St. Paul, Minnesota.

Shirley, C. 1991. "Less Milk, More Profit." *New Farm* (Sept./Oct).

Milkhouse Waste

Harlow, S. 1992. "Organic Waste Beds." *The New England Farmer* (March).

Samson, R. 1990. "Taking the P out of your washwater." *Sustainable Farming*. (Autumn).

Books/Publications/Periodicals

Acres, USA, 10008 East 60th Terrace, Kansas City, MO 64133.

Albrecht, W. A. 1989. *The Albrecht Papers*, Vol. III, Charles Walters Jr., ed. Halcyon House Publishers and Acres, U.S.A., Raytown, MO.

Albrecht, W.A. 1958 (third printing, 1975). *Soil Fertility and Animal Health*. Fred Hahne Printing Co., Webster City, IA.

American Journal of Alternative Agriculture. Institute for Alternative Agriculture, 9200 Edmonston Road, Suite 117, Greenbelt, MD 20770.

de Bairacli Levy, J. 1984. *The Complete Herbal Handbook for Farm and Stable*. Faber and Faber, Limited, London. Available from Richter's, Goodwood, Ontario, LOC 1AO, Canada.

Fraser, C. ed. 1986. *Merck Veterinary Manual*, 6th ed. Merck and Co, Inc. Professional Handbook Dept., PO Box 2000, Rahway NJ 07065.

Hainsworth, P.H. 1954, reprinted 1976. *Agriculture, The Only Right Approach*. Bargyla Rateaver and Gylver Rateaver, eds. Rateavers, San Diego, CA. Available from Bargyla and Gylver Rateaver, 9049 Covina St., San Diego CA 92126.

Henry, W.A. 1923 (18th edition). *Feeds and Feeding: A Handbook for the Student and Stockman*, rewritten by F.B. Morrison. Henry Morrison Publishing Co., Madison, WI. Out of print; available at agricultural libraries.

Hess, Leon. *The Treatment of Cattle by Homeopathy*. 675 S. Kinzer Ave., New Holland, PA. 17557.

Hills, L.D. 1976. *Comfrey, Fodder, Food and Remedy*. Universe Books, New York.

Kaffka, S.R. 1987. *Sustaining the Smaller Dairy Farm in the Northeast, Proceedings of a conference sponsored by Sunny Valley Foundation, Inc.* Litchfield, CT: October 4-7, 1987. Available from Cathy Setterlin, Pratt Center, 163 Paper Mill Road, New Milford, CT 06776.

Koepf, H.H. *The Bio-Dynamic Farm: Agriculture and Service of the Earth and Humanity*. Anthroposophic Press, RR4, Box 94A1, Hudson, NY 12534.

The Land Stewardship Project, 180 E. Main, P.O. Box 130, Lewiston, MN 55952. Publications include: "A Summary of On-Farm Research and Demonstration Projects in On-Farm Composting," "Mechanical Weed Control," "Nitrogen Management," and "Time-Controlled Grazing."

Livestock Health and Nutrition Alternatives: A Western States Conference Proceedings. Available from AERO, 44 N. Last Chance Gulch, Helena, MT 59601, (406) 443-7272.

MacLeod, G. 1981. *The Treatment of Cattle by Homeopathy*. Health Science Press. Available from Standard Homeopathic Company, PO Box 61067, Los Angeles, CA 90061.

MacLeod, G. 1983. *Veterinary Materia Medica*. C.W. Daniel Co. Available from Standard Homeopathic Company (address above).

Murphy, W.W. 1987. *Greener Pastures on Your Side of the Fence*. Arriba Publishing, 213 Middle Road, Colchester, VT 05446.

The New England Farmer. PO Box 4187, 50 Bay St., St. Johnsbury, VT 05819.

New Farm. 222 Main Street, Emmaus, PA 18049.

The North American Organic Dairy Directory and Farm Case Studies. Available from NOFA-VT, P.O. Box 697, Richmond, VT 05477.

Parnes, R. 1990. *Fertile Soil: A Grower's Guide to Organic and Inorganic Fertilizers*. agAccess, Davis, CA.

The Pasture Prophet/Profit. Northeast National Technical Center, 160 East Seventh Street, Chester, PA 19013-6092.

Savory, A. *Holistic Resource Management*. Center for Holistic Resource Management, Albuquerque, NM 87102.

Stockman Grass Farmer. Mississippi Valley Publishing Corp. 5135 Galaxie Drive, Suite 300C, Jackson MS 39206.

Sustainable Farming. REAP Canada, Box 125, Glenalldale House, Ste-Ann-de-Bellevue, Quebec, H9X 1C0 Canada.

Turner, N. 1974. *Fertility Pastures and Cover Crops*. Bargyla and Gylver Rateaver, 9049 Covina St., San Diego, CA 92126, (619-566-8994).

United States Department of Agriculture. *Cover Crops Handbook*. Sustainable Agriculture Publications, Aerospace Center, Washington, D.C.

Voisin, A. *Grass Productivity*. Island Press, available from Acres USA, PO Box 9547, Kansas City, MO 64133.

Ordering Additional Copies of the Proceedings

Additional copies of the proceedings are available from the NOFA chapters listed below at \$3.95 each plus shipping and in-state sales tax. Please specify which crop proceedings you are ordering (apple, sweet corn, greenhouse bedding plants, livestock or strawberries). You may also join one of NOFA's seven state chapters by including the appropriate dues listed below for your state.

NOFA/Connecticut: Box 386, Northford, CT 06472

Proceedings: \$3.95 each plus 6% tax (24¢) plus \$1.75 shipping for a total of **\$5.94**.

Dues: Individual or household: \$25, Institution: \$50, Supporting: \$100, Low income: \$15

NOFA/Massachusetts: 411 Sheldon Road, Barre, MA 01005, (508) 355-2853

Proceedings: \$3.95 each plus 5% tax (20¢) plus \$1.50 shipping for a total of **\$5.65**.

Dues: Individual: \$25, Family: \$35, Low income: \$15, Supporting: \$100

NOFA-New Hampshire: Jan C. LaPlante, c/o Green Pastures Estate, 38 Ladds Lane, Epping, NH 03042

Proceedings: \$3.95 each plus \$1.30 shipping for a total of **\$5.25**.

Dues: Individual: \$25, Family: \$35, Student/Senior: \$18, Supporting: \$100

NOFA-New Jersey: 31 Titus Mill Road, Pennington, NJ 08534, (609) 737-6848

Proceedings: \$3.95 each plus 6% tax (24¢) plus \$2.50 shipping for a total of **\$6.69**.

Dues: Individual: \$25, family/organizational: \$35, Supporting: \$50, Sponsor: \$100

NOFA-New York: P O Box 21, South Butler, NY 13154, (315) 365-2299

Proceedings: \$3.95 each plus \$1.50 shipping for a total of **\$5.45**.

Dues: Student and Senior (over 65): \$15, Student and Senior Family (2 adults): \$20, Individual: \$25, Farm Listing: \$30, 2 adult family: \$30 (each additional adult, \$5), Business: \$35, Patron: \$100, Corporate Sponsor: \$500, Lifetime: \$1000

NOFA/Rhode Island: c/o Casey Farm, 2325 Boston Neck Rd., Saunderstown, RI 02874

Proceedings: \$3.95 each plus 7% tax (28¢) plus \$1.75 shipping for a total of **\$5.98**.

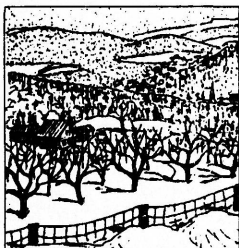
Dues: Individual: \$20, Family: \$25, Supporting: \$50, Lifetime: \$250

NOFA-Vermont: PO Box 697, Richmond, VT 05477

Proceedings: \$3.95 each plus 5% tax (20¢) plus \$1.21 shipping for a total of **\$5.36**.

Dues: Individual or Family: \$20, Supporting: \$35, Sponsoring: \$75

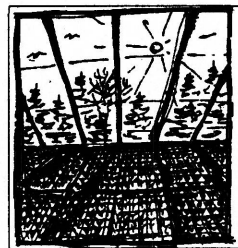
Some participants in the grower groups came from Maine, where the Maine Organic Farmers and Gardeners Association (MOFGA) performs work similar to NOFA's. MOFGA's address is Box 2176, 283 Water Street, Augusta, ME 04330, (207) 622-3118.



Apples



Sweet Corn



Greenhouse



Livestock



Strawberries

