14 Entries from Temiskaming (6-7 farmers)
TSCIA Project - Red Clover Case Bearing Growth - No Red Clover Prod. in 1 Yr.
Aphid Monitor - or Jetstream / Meteorological Monitor

25th ANNUAL

NORTH EASTERN ONTARIO AGRICULTURAL CONFERENCE

FEB. 25th, 26th & 27th, 1991

NEW LISKEARD COLLEGE OF AGRICULTURAL TECHNOLOGY

1991 CONFERENCE PROCEEDINGS

TABLE OF CONTENTS

Page

WELCOME TO THE CONFERENCE, David Beattie.......................... 1

SCHEDULE OF EVENTS.. 2

CROP PRODUCTION

LAND STEWARDSHIP II, Harold Rudy.......................... 1-1

NORTHERN FIELD CROP RESEARCH UPDATE FOR 1990, Laurier Guillemette.................................. 1-3

FIELD CROP RESEARCH UPDATE, SOILS RESEARCH AT NLCAT IN 1990, John Rowsell............................ 1-6

BACTERIAL SILAGE INOCULANTS - DO THEY WORK, Dr. Bryan McKerzie........................ 1-11

COMPARING CANADIAN COSTS OF PRODUCTION TO THOSE IN THE U.S.,David Hope................................. 1-14

NORTHERN FIELD CROP RESEARCH UPDATE, NLCAT 1990 A.V. Skepasts... 1-16

HORTICULTURAL CROPS

ORNAMENTALS AT KAPUSKASING, Laurier Guillemette......... 2-1

MULCHES AND ROW COVERS IN THE NORTH, Becky Hughes.. 2-3

AN UPDATE ON GATT, Bill Mitchell.............................. 3-1

LIVESTOCK PRODUCTION

MILKHOUSE WASTE DISPOSAL, Harold House.................. 4-1

FEEDING SYSTEMS, Brian Bell.............................. 4-6

MANURE STORAGE, Dr. S.F. Barrington..................... 4-8

25th ANNUAL
NORTH EASTERN ONTARIO AGRICULTURAL CONFERENCE AND TRADE SHOW

New Liskeard College of Agricultural Technology
February 25-27, 1991

TRADE SHOW OPEN - 1 pm - 9 pm February 25th and 8:30 am - 4:30 pm February 26th
N.E.O.S.C.I.A. CHAMPIONSHIP FORAGE AND SEED SHOW AND THE POTATO SHOW OPEN -
8:30 am - 4:30 pm Feb 26th

MONDAY, FEBRUARY 25

CONCURRENT SESSIONS

CROP PRODUCTION

2:00 - 2:30 pm
Land Stewardship II
Harold Rudy, Program Manager, Ontario Soil and Crop Improvement Association

2:30 - 3:30 pm
Minimum Tillage Production
Paul Sullivan, Soils and Crops Advisor, OMAF, Nepean

3:30 - 4:30 pm
Northern Field Crop Research Update for 1990
Laurier Guillemette, Agriculture Canada, Kapuskasing; A.V. Skepasts, Agronomy Section, NLCAT

HORTICULTURAL CROPS

2:00 - 2:30 pm
Ornamentals At Kapuskasing
Laurier Guillemette, Agriculture Canada, Kapuskasing

2:30 - 3:30 pm
Mulches and Row Covers in the North
Becky Hughes, Agronomy Section, NLCAT

3:30 - 4:30 pm
Presenting Your Product
Ken Forth, Rockton Berry Farm, Lynden, Ontario

7:00 pm **ANNUAL MEETING OF N.E.O.S.C.I.A.**

7:30 - 10:00 pm **BEEF IMPROVEMENT WORKSHOP**
Sponsored by OMAF, Canadian Beef Sires and the Temiskaming Beef Herd Improvement Club

7:30 - 10:00 pm **HORSE CONFORMATION, SELECTION AND CLIPPING**
Wendy Johnston, Terry-Lynn Chartrand and Trudy Ouimette-Dinnissen, NLCAT

TUESDAY, FEBRUARY 26

JOINT SESSION

10:00 - 10:15 am **Welcome**
Les Hillstrom, President, North Eastern Ontario Soil and Crop Improvement Association

10:15 - 11:00 am **Future Trends for Ontario Agriculture**
Honourable Elmer Buchanan, Minister of Agriculture and Food

11:00 am - 12:00 **An Update On GATT**
Bill Mitchell, Assistant Director of Board/Industry Relations, Ontario Milk Marketing Board

12:00 - 1:30 pm LUNCH - COLLEGE RESIDENCE CAFETERIA

CONCURRENT SESSIONS

CROP PRODUCTION

1:30 - 2:30 pm
Silage Preservatives
Dr. Bryan McKerzie, Crop Science Department, University of Guelph

LIVESTOCK PRODUCTION

1:30 - 2:30 pm
Manure Storage
Dr. Suzelle Barrington, Faculty of Agriculture, Macdonald College

2:30 - 3:00 pm REFRESHMENTS AND TRADE SHOW

CROP PRODUCTION

3:00 - 3:30 pm
Northern Field Crop Research Update for 1990
John Rowsell, Agronomy Section, NLCAT

3:30 - 4:30 pm
Costs of Production in Canada vs the U.S.A.
David Hope, Section Chief, Financial Analysis, OMAF, Chatham

LIVESTOCK PRODUCTION

3:00 - 3:30 pm
Milk House Waste Disposal
Harold House, Dairy Structures Engineer, OMAF, Clinton

3:30 - 4:30 pm
Computerized Feeding Systems
Brian Bell, Dairy Specialist, OMAF, Sault Ste-Marie;
J.C. Chartrand, A. Chartrand & Sons, New Liskeard;
Rob Giesen, Leah Valley Dairy Farms, Englehart

6:30 pm **BANQUET** - Riverside Place, New Liskeard

THERE'S MORE TO BRAZIL THAN THE RAIN FOREST
Marilyn Bidgood, Farm Management Specialist, OMAF, Elmvale and Frank Haasen, Haasens' Holsteins, Timmins

N.E.O.S.C.I.A. AWARDS PRESENTATIONS

WEDNESDAY, FEBRUARY 27

9:00 am - 12:00 **WORKSHOPS**
Enrolment limited.

Dairy Heifer Workshop	Paul Gumprich, Animal Science Section, NLCAT
Interpreting Your Soil Tests	John Rowsell, Agronomy Section, NLCAT
Pelvic Measurements in Cattle	Denis Lavoie and Gerald Ratte, Agriculture Canada, Kapuskasing
Plow Adjustment	Ron Bailey, Animal Science & Engineering Section, NLCAT
Stress Management	Lera Ryan, Family Resource Management Specialist, OMAF, Guelph

LAND STEWARDSHIP II

Harold B. Rudy
Program Manager
Soil and Crop Program Division
Ontario Soil and Crop Improvement Association

Land stewardship implies that resources are managed in such a manner that they are not depleted and remain equally productive for future generations. In the broadest sense, land stewardship includes the management of soil, crops, wetlands and forest resources not only to maintain productive capability, but also to protect the surface and ground water resources.

The 1980's generated a new level of awareness with Great Lakes water quality monitoring results, decline in crop production from compaction, erosion and water quality degeneration at the local level. Society recognizes the importance of resource conservation and is willing to allow public funds to be used to finance programs for soil and water conservation.

The Ontario Soil Conservation and Environmental Protection Assistance Program (OSCEPAP) was initiated in 1983 to encourage the construction of soil erosion control structures to manage surface water. Manure storages over 200 days were also encouraged to allow for timely application of manure to benefit the environment. OSCEPAP II modified the program in 1986 to include pesticide storages and retirement of fragile land. The Land Stewardship Program in 1987 initiated financial incentives to encourage the improvement of tillage and cropping practices. Grass-roots administration by a local committee of the Ontario Soil & Crop Improvement Association (OSCIA) proved to be highly successful.

In 1990, the Canada-Ontario Accord on Soil Conservation was signed between the Federal government and Ontario government. The Nation Soil Conservation Program (NSCP) and Land Stewardship II (LS II) program have been initiated under this Accord. The NSCP, representing $11.1 million in federal funds is targeted to the retirement of fragile land. Buffer strips adjacent to streams and water courses are eligible as fragile because of their proximity. Up-slope fragile areas greater than 5% frequently contribute 15 ton/acre per year of soil erosion under row crops. Flood plains are also considered as fragile land.

Landowners are required to submit a bid or tender valued up to $10,000. Local OSCIA committees will be looking for quality proposals and also identifying priorities for fragile land retirement. The bid deadline for Northern Ontario is April 1, 1991.

LS II is a compilation of soil conservation structures, environmental structures and practices (residue management, equipment modifications, cover crops, and strip cropping). Funded by the Ontario Ministry of Agriculture and Food, LS II also provides incentives for demonstration sites, technology evaluation, education and promotion.

LS II requires that each applicant complete and submit a comprehensive Conservation Farm Plan. This plan is designed, through local workshops, to recognize soil and water quality problems, identify resources on the farm and select appropriate measures to resolve the problems. Each applicant may receive up to $10,000 (subject to previous program grants). LS II ends on March 31, 1994.

Through the federal-provincial accord, agricultural producers have a broad range of options to address soil and water quality issues. As landowners and producers of food, we have a corporate responsibility to demonstrate to society that we are good land stewards and are responding to the opportunities provided by our federal and provincial government under these timely programs.

Northern Field Crop Research Update for 1990

Laurier Guillemette, Agriculture Canada
Experimental Farm, Kapuskasing, Ontario

The field crop research program at the Kapuskasing Experimental Farm has been integrated within the beef research program of the farm. The crop program is divided into two major thrusts:

A) Cultivar evaluation of forages, cereals and to a smaller extent horticultural crops for eastern Canada.

B) Management studies in forages, cereals and horticultural crops in order to improve persistence, quality and efficiency of these crops under northern latitudes.

The data generated from cultivar and management trials is used in the formulation of provincial recommendations in Ontario and Québec.

As the beef research program at the farm is the major mandate of the station, the forage program must be oriented in support of this mandate. Northern Ontario with its large acreage, cool climate and soil conditions is ideally suited for the production of forages. Some of the best quality forages of the province can be produced in this part of the province. Long day length and cool nights produce the ideal conditions for optimizing the water soluble sugar content of our forages. This presentation will highlight some of the more recent changes in cultivar recommendation and introduce some preliminary information on a relatively new grass for this area namely Perennial Ryegrass (PRG).

In 1990, several variety trials were harvested across the north in order to support registration of new cultivars and to be added to the list of recommended varieties in publication 296 "Ontario Field Crop Recommendations". All of these changes in publication 296 are the direct result of many years of testing across many locations in Ontario. As for the north, the data was generated at New Liskeard, Thunder Bay and Kapuskasing. Here are some changes that will appear in this spring's issue in the forage section:

<u>Additions</u>

ALFALFA:	MPR	APOLLO SUPREME
	LEGEND	5311
	588	5364
	G-2841	

TIMOTHY: MOHAWK, CAROLLA

ORCHARD GRASS: MOBITE

TALL FESCUE: STEF, FESTORINA

Removals

ALFALFA: REGAL, PRIMAL, VALOR

TIMOTHY: SALVO

Perennial Ryegrass (PRG)

Aside from the conventional species, efforts are also directed toward new species such as perennial rye grass, tall fescue and others.

In 1986 and 1987, six medium maturity and nine late maturing PRG cultivars were sown in mono culture or in association with white clover at Kapuskasing, Ottawa and Guelph. Under a pasture-simulation clipping regime for a period of six station years of sowing, four survived to produce yields in the first production year, and one produced a second production year yield. In mono culture and in mixtures, medium maturing cultivars equalled or exceeded the yield of late maturing cultivars. With the exception of late maturing cultivars sown at Guelph, monoculture yields or orchard grass checks consistently exceeded that of the PRG entries. A similar but less pronounced trend was exhibited in mixtures. Winter hardiness of European bred cultivars appeared unacceptably low especially at Kapuskasing and Ottawa, although cultivar differences were apparent. The presence of an interseeded legume did not appear to enhance winter hardiness or persistence relative to that of grass plus N fertilizer. Among the 15 listed cultivars, the low yields and lack of consistent cultivar performance over sites and years suggest that the management systems, rainfall and temperature may be contributing factors which affect the performance of PRG in Ontario.

In the spring of 1988, 88 entries of PRG from Northern Europe were introduced in an observational trial at Kapuskasing, Normandin and Ste-Foy, Québec. Excellent winter survival was obtained over the 88-89 winter at Kapuskasing, and somewhat limited survival at both Normandin and Ste-Foy. The 1989-90 winter produced considerably more damage at Kapuskasing site. Management of this crop late in the fall appears to be of critical importance to the survival of the crop over the winter. Before the onset of the first winter, the crop was literally shaved off from the field late in the fall thus leaving very little leaf residue for snow molds, whereas in the second fall the crop was mowed with a swather leaving a larger volume of leaves going into the winter. Apparently this crop is very sensitive to snow molds and since our winters and late springs are conducive for creating these molds, the management of this crop in late fall is a topic for further studies.

In the next few years, selections from these preliminary studies will be tested under different types of crop managements.

There are still many unanswered questions when it comes to evaluating and managing this new forage crop and until this is tested, it would be unwise to recommend its use in our region.

Field Crop Research Update
Soils Research at NLCAT in 1990

John Rowsell
Lecturer, Soils
New Liskeard College of Agricultural Technology

Two areas of soils research conducted at NLCAT in 1990 will be highlighted in this paper. These are the research on the effectiveness of PB-50, and research involving nitrogen soil testing.

PB-50

PB-50 is a product being developed by PhilomBios of Saskatoon Sask. PB-50 consists of the spores of the fungus *Penicillium bilaji.* It has repeatedly been reported in scientific literature that seeds treated with these spores prior to planting grow into plants that develop a relationship with the fungus akin to that of legumes treated with *Rhizobium sp.* bacteria. *Rhizobium* bacteria make atmospheric nitrogen available to legumes. The *Penicillium bilaji* fungus helps plants to obtain phosphorus from the soil and fertilizer. Unlike the *Rhizobium* bacteria, the *Penicillium* fungus does not form nodules on the roots of the plants and is not restricted to forming a relationship with just legumes.

The PB-50 experiments conducted by NLCAT were performed at the NLCAT main campus in New Liskeard, at the Verner Test Site in Verner and at the NLCAT Thunder Bay Research Station. The Thunder Bay test was under the direction of John Heard, NLCAT's field crops researcher in northwestern Ontario. Various rates of phosphorus were placed in the row with seeds of alfalfa or barley that were either treated with PB-50 or not treated. All of the alfalfa was pre-innoculated with *Rhizobium.* Yield results were available at time of preparation of this paper. Results of tissue testing and post-harvest soil testing were not.

Yield results are presented in the table 1. It is surprising that there was no significant yield response to applied phosphorus fertilizer, particularly in Thunder Bay where initial soil test levels were low. PB-50 treatment did give significant yield advantages alone or in interaction with phosphorus fertilizer in two tests; but, these yield advantages were slight. Results indicate that further testing of PB-50 is warranted.

Nitrogen Soil Testing

Two experiments were conducted at the NLCAT main campus where various rates of nitrogen were applied, a crop grown and soil samples collected after harvest. If significant amounts of soil nitrate nitrogen are left after harvest, that nitrate nitrogen has the potential to be a pollution threat. Results of analyzing these experiments revealed some interesting results.

The first experiment that will be discussed is one that we call the 'Residual Nitrogen' test. The purpose of this experiment was to determine the quantity of

Table 1. Yield Effects of PB-50 and Phosphorus Fertilizer

Location	Crop	Soil Test P in ppm (Recommended P Rate)	P Rates kg/ha (increment)	Mean Yield of the Test in kg/ha	Results (Confidence Level)
New Liskeard	Barley	18 (20 kgP/ha)	0-50 (10 kg/ha)	4046	No significant yield response to P or PB-50
New Liskeard	Alfalfa	18 (20 kgP/ha)	0-50 (10 kg/ha)	7502 (1 cut)	No significant yield response to P or PB-50
Verner	Barley	18 (20 kgP/ha)	0-50 (10 kg/ha)	3957	No significant yield response to P or PB-50
Verner	Alfalfa	18 (20 kgP/ha)	0-50 (10 kg/ha)	3963 (1 cut)	Significant positive interaction between P and PB-50 (96%)
Thunder Bay	Barley	3 (110kgP/ha)	0-150 (50 kg/ha)	4020	Significant yield advantage to PB-50 (>99%)

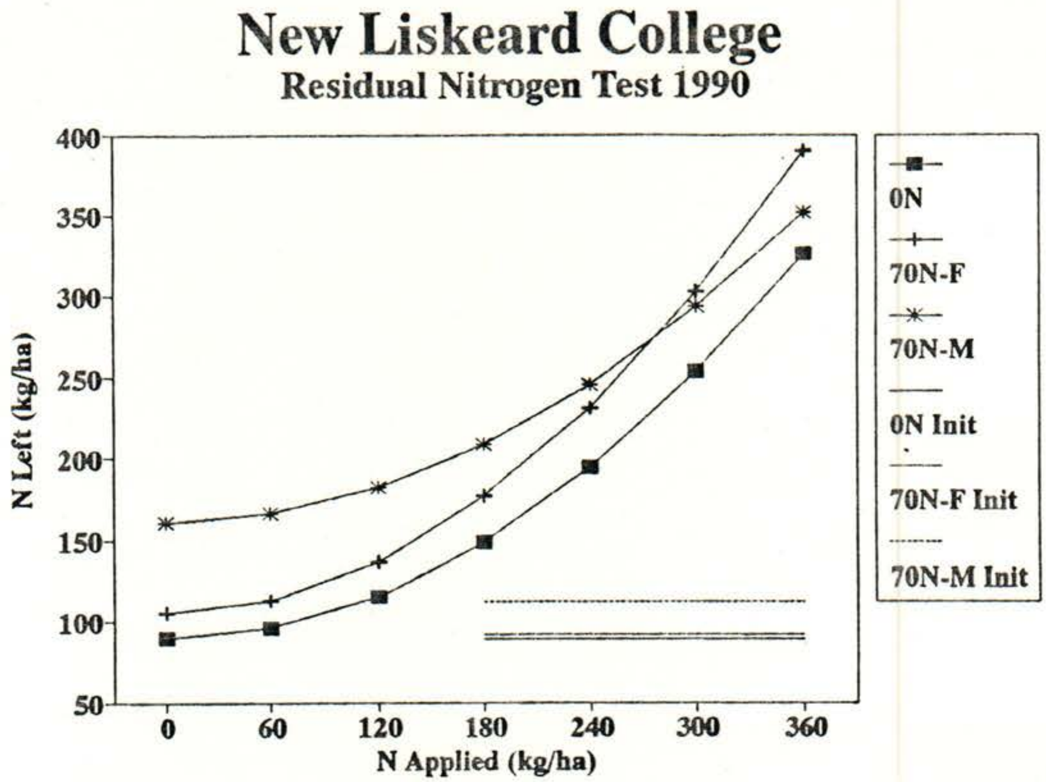
nitrogen available to succeeding barley crops. Three strips of land were prepared for this experiment in 1989. One received no nitrogen fertilizer, another received the equivalent of 70 kgN/ha (the recommended rate for barley in northern Ontario) in the form of ammonium-nitrate fertilizer, and the remaining strip received 70 kgN/ha in the form of manure spring applied and shallow incorporated. A barley crop was then grown on each of the strips and harvested in 1989.

In 1990, each of the strips was divided into four replicates and each replicate received nitrogen treatments from 0-360 kgN/ha from fertilizer in increments of 60 kgN. A barley crop was again grown and harvested from each of the strips. Soil samples were collected prior to applying the N treatments and after harvest. These soil samples were analyzed for P, K, pH and for nitrate nitrogen. The results of the nitrate-nitrogen analyses are presented in figure 1. Please keep in mind that the design of the experiment allows comparison within each of the initial strips (0 kgN/ha in 1989, 70 kgN/ha from fertilizer and 70 kgN/ha from manure) but not between these strips.

The data suggest that about 80-115 kg of nitrate nitrogen per hectare was present in the soil in the spring of 1990 on all strips. Application of additional N from fertilizer in 1990 did not appreciably affect the amount of nitrate nitrogen

The nitrate-nitrogen content of the soil may have decreased slightly over the growing season in the strips that had received 0 kgN/ha and 70 kgN/ha from fertilizer in 1989 where no nitrogen was applied in 1990. In the strip where manure had been applied in 1989, the nitrate-nitrogen content of the soil may have increased over the growing season where no N had been applied in 1990.

Figure 1.



LEGEND:

0N — Post-harvest 1990 soil nitrate-nitrogen levels where no nitrogen applied in 1989
$N\ Left = 89.35 + 0.00183N\ applied^2$ $r^2 = 0.54$ $P>F = 0.000$

70N-F — Post-harvest 1990 soil nitrate-nitrogen levels where 70 kgN/ha applied in 1989 in the form of fertilizer
$N\ Left = 105.22 + 0.00220N\ applied^2$ $r^2 = 0.69$ $P>F = 0.000$

70N-M — Post-harvest 1990 soil nitrate-nitrogen levels where 70 kgN/ha applied in 1989 in the form of manure
$N\ Left = 161.06 + 0.00147N\ applied^2$ $r^2 = 0.21$ $P>F = 0.024$

0N Init — Pre-N application 1990 soil nitrate-nitrogen levels where no nitrogen applied in 1989

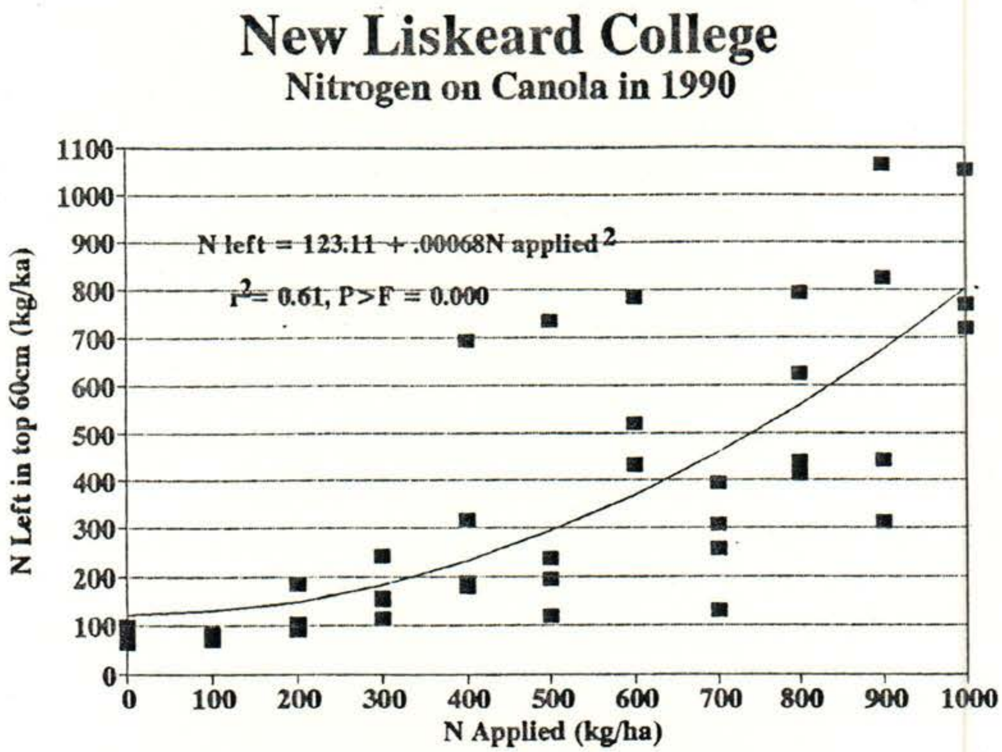
70N-F Init — Pre-N application 1990 soil nitrate-nitrogen levels where 70 kgN/ha applied in 1989 in the form of fertilizer

70N-M Init — Pre-N application 1990 soil nitrate-nitrogen levels where 70 kgN/ha applied in 1989 in the form of manure

The second experiment of 1990 where nitrate-nitrogen soil test data were collected is referred to as the 'Nitrogen on Canola' trial. The purpose of this trial is to determine the most profitable rate of nitrogen fertilization of canola grown in northern Ontario.

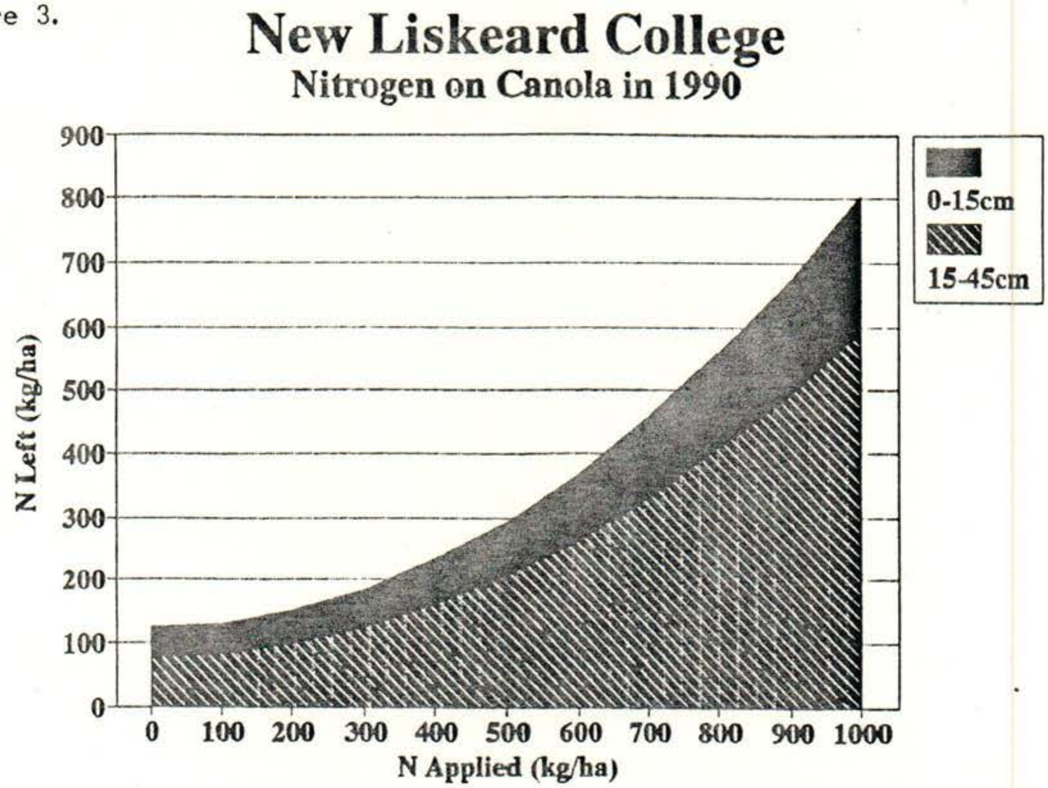
In the nitrogen on canola trial, rates of 0-1000 kgN/ha, in increments of 100 kgN/ha, were applied to plots in 4 replicates, and canola was grown. Soil samples were collected post-harvest and results of nitrate-nitrogen analyses are shown in figures 2 and 3.

Figure 2.



There is a strong relationship between the nitrogen applied in the spring and that remaining in the top 60 cm of soil after harvest (figure 2). Again, as in the 'Residual Nitrogen' trial, it appears that rates of N application from fertilizer below about 150 kg/ha do not leave appreciable amounts of N in the soil after harvest. It should be noted that the relationship appears to be exponential indicating that rates over about 150 kgN/ha result in increasingly increasing amounts of nitrate-nitrogen in the top 60 cm of the soil. That N may be subject to leaching into ground water and should be considered to be a potential pollutant.

Figure 3.



Regressions:

0-15cm	N Left=45.90+0.000166N applied^2	r^2=0.56	P>F=0.000
15-60cm	N Left=77.20+0.000514N applied^2	r^2=0.58	P>F=0.000

The nitrogen in this experiment was applied to the surface and gently raked to attempt to cover it. Between application and the soil sampling, approximately 320mm of rain fell on the plot area. Figure 3 shows the distribution of the nitrate-nitrogen between the top 0-15cm (0"-6") and the lower 15-60cm (6"-24"). The data suggest that an appreciable amount of the nitrogen applied at the higher rates moved at least 15cm through the clay soil at the college over the growing season.

Conclusions

Preliminary work with PB-50 indicate that the fungus *Penicillium bilaji* may have the potential to enhance phosphorus uptake from the soil and from fertilizer by alfalfa and barley.

As well, preliminary work using nitrate-nitrogen soil testing indicate that the pre-planting application of nitrogen, in the form of fertilizer, at rates of less than 120-150 kgN/ha has little impact on the amount of nitrogen left in the soil after harvest of barley and canola on the clay soils at NLCAT, and that there should be little pollution threat from nitrogen fertilizers used in this way.

BACTERIAL SILAGE INOCULANTS - DO THEY WORK?

Bryan D. McKersie
Crop Science Department
University of Guelph

Silage additives have been an area of fluctuating interest ever since silages were first made. There have been many types. There were the strong acids such as hydrochloric and sulphuric; the weaker organic acids such as formic, acetic and propionic; then added feedstuffs such as molasses or chopped grain; the complex chemical mixtures which promoted favourable microbial growth, inhibited unfavourable microbes and prevented oxidation; the sterilants such as formaldehyde; the added nitrogen source such as urea or anhydrous ammonia. All of the above have advantages, but also serious limitations. The acids are effective but dangerous to use, corrosive and not economical; the added feedstuffs are bulky and time consuming to add; the complex chemicals rarely worked; formaldehyde has been shown to be carcinogenic to rats; added nitrogen sources can effectively increase the protein content of corn silage to about 12%, but are of only limited use on hay crop silages. As a result, producers have often tried a product to overcome a specific problem, been dissatisfied for any one of a variety of reasons, and not bought the product again.

To this long list of additives, we can now add bacterial silage inoculants. They avoid many of the problems associated with previous types of additives. They are not corrosive and not dangerous to handle; they are easy to apply with relatively inexpensive machinery at a relatively low cost. The only remaining question, which has yet to be satisfactorily answered, is - do they work? To answer this nagging question, a 3 year research project was initiated to test the efficacy of some commercial products on Ontario crops.

Silage inoculants are bacterial cultures of _Lactobacillus plantarum_ and/or other bacterial species which serve to increase the numbers and aggressiveness of lactic acid bacteria on the forage at the time of ensiling, and thereby stimulate the rate and extent of fermentation. For some as yet undefined reason, this leads to increased dry matter recovery and increased animal performance. Some American studies estimate that this benefit may be about 10 lb more beef produced per tonne of forage put into the silo, or in other words, $8.00 return for a $1.20 investment.

To understand how inoculants work, a brief review of fermentation in silages is in order. When a forage crop, alfalfa or corn, is chopped and packed into the silo, it rapidly consumes the oxygen (air) trapped in the silo, and the atmosphere surrounding the plant and the bacteria on the plant becomes anaerobic (no oxygen). The anaerobic, lactic acid bacteria are able to grown in the absence of oxygen by fermenting the sugars in the plant into lactic, acetic and other acids. As a result the pH (inverse of the degree of acidity) declines, indicating that the acidity of the silage is increasing. Eventually, the silage becomes so acid that any further growth of bacteria is inhibited. The silage at this stage is stable and can be stored for a long period of time provided that it is not exposed to oxygen (air). The rate at which this fermentation occurs is important, because when the silage is at an unstable pH (ie. between pH of 4.5 and 6.0), it is susceptible to degradation leading to the production of antiquality products which reduce animal performance. If the silage does not attain a sufficiently low pH, other bacteria continue to grow which in the presence of air causes heating, or in the presence of high moisture causes butyric acid production; both of which are extremely detrimental to silage quality.

Silage inoculants supposedly introduce large numbers of a more aggressive type of lactic acid bacteria into the silage, which are better able to use the sugars in the plant, and are more efficient in their acid production. If they are achieving this, then they should increase the rate of pH decline in the ensiled forage. To test their response, wilted alfalfa forage and whole plant corn were chopped using farm scale machinery. Piles of forage were weighed and inoculated with the recommended rates of the commercial inoculants. The forage (12 kg) was then packed into a pail with a hydraulic press and sealed to exclude oxygen. Pails were then opened, at various times after ensiling, the silage sampled and pH measured.

The experiment has been repeated about 15 times to examine the effects of various management practices on the efficacy of the inoculants. The factors which have been examined are:

1) type of commercial inoculant
2) rate of inoculant application
3) type of forage ensiled - alfalfa, red clover, whole plant corn, whole plant barley, ground ear corn
4) first compared to second cut alfalfa
5) moisture content of alfalfa
6) maturity of alfalfa

All of the above management factors influenced the degree to which the silage inoculants stimulated fermentation, <u>but</u> a consistent observation was that the application of a silage inoculant to the forage did stimulate the rate of pH decline - or in other words, they worked. There are however several qualifiers to this statement:

1. Granular inoculants were not always as effective as liquid applied inoculants. In about half of the studies conducted, Silabac brand 1177 (granular) stimulated the rate of fermentation; in the other half, it had no effect compared to a non-treated control. Liquid applications of other inoculants were consistent in their response and on alfalfa silages, always stimulated fermentation; the amount of stimulation varied, but it was a consistent beneficial stimulation.

2. The rate of application had only a small effect on fermentation of alfalfa silages. Applications at 1/10 the recommended rate produced less stimulation than 10 times the recommendation, but low rates of application still elicited a significant, beneficial response.

3. A very definite difference was observed among the various crop species ensiled. Alfalfa and red clover silages consistently showed a response, but in whole plant corn, whole plant barley, and high moisture ground ear corn no response could be detected. The latter crops are high energy crops which contain large amounts of carbohydrates, and have a low buffering capacity (ie. requires less lactic acid to reduce the pH to stable pH range of 4.0 - 4.5). Therefore, these crops are relatively easy to ensile, and they typically

ferment very quickly reaching stability in about 7-10 days.

In contrast, alfalfa and red clover are ensiled as protein crops. They are relatively low in carbohydrate and have a high buffering capacity (takes more lactic acid to reduce pH to 4.5 than in corn). Therefore, these crops ensile relatively slowly, taking over 28 days in many cases before they are stable, and consistently do not reach as low a pH as corn.

4. The management of the alfalfa crop is very important. Early bud (high protein) alfalfa ferments more slowly than full flower alfalfa, and the inoculant has a more dramatic effect on early bud forage.

So the bottom line from these studies is that these products do work in alfalfa silage and <u>should</u> provide an economic benefit. It is however difficult to predict the rate of return from these products with any degree of accuracy because of variability in crop management and response. This is in fact what has been observed in the U.S. by researchers in Pioneer using Silabac brand 1177 - namely that the response is usually positive, but variable.

COMPARING CANADIAN COSTS OF PRODUCTION TO THOSE IN THE U.S.

Dave Hope, Policy Analysis Branch

Comparative cost structures and our ability to compete are topics that have attracted a lot of interest and considerable press in the last two years. I know that many of you would like me to make some very definitive statements. I do feel that I have some comments that will shed some light on the true situation, however I want to start by cautioning you about some of the problems associated with this topic of comparing costs between two countries.

Cost of production is a concept that is often misunderstood and even more often abused. Users often assume that a particular cost structure represents a larger group than is really appropriate. We probably all agree that there is considerable variation in costs within almost any industry and this is certainly true for most agricultural enterprises. For example, the cost of producing corn in Ontario varies considerably from farm to farm, even within a county. Variation in yield is important as are machinery and other costs. The same variation exists in canola, barley or beef cattle. This variation is complicated by the fact that there are several ways to calculate some costs. Thus when we compare two cost studies done for two different regions we have to deal with the fact that two researchers probably used two different methodologies to calculate some of the costs. In addition, the cost budget in each study does not represent many of the producers in the region that it represents.

If we agree that the published provincial and state budgets are not particularly useful, what can we look at? One area of concern is the actual price paid for particular inputs such as fertilizer and pesticides. A couple of years ago most of the literature and speeches seemed to suggest that our American neighbours had access to inputs that were in all cases cheaper than those we could purchase in Canada. More recently several presentations have been made suggesting that this is not necessarily so. Some inputs are cheaper in the U.S., the questions we should address are; which inputs, how much cheaper, and why?

The inputs for which there appears to be general agreement that some significant price savings exist in the U.S. include interest rates and pesticides. The interest rate spread has increased considerably over the last two years due to federal government monetary policy. The importation of pesticides into Canada is controlled by regulation thus providing the opportunity for differential pricing in the two countries. The case for significant price differences in other input areas is not as clear cut as some people might suggest and I will attempt in my presentation to address these other inputs.

/2

In summary, competitiveness is a broader issue than input pricing. Ontario agriculture has many strengths that make me think that we will find ways to compete. When addressing the topic of input costs it is important that we focus on the areas were significant differences truly exist and on the reasons behind those differences. You should recognize that your greatest resource is yourself, an Ontario farmer, and the importance of your own willingness to compete and be successful should not be undersold.

NORTHERN FIELD CROP RESEARCH

RESEARCH UPDATE NLCAT 1990
by A.V. Skepasts, P.Ag.

Depressed grain prices are mixed blessings for many farmers. Livestock producers can benefit from lower grain prices, but on the other hand grain growers will realize reduced profits from their enterprise.

Regardless of the various economic considerations NLCAT is continuing research in grain production.

We realize that the grain producers have to economize their expenses in order to maintain the profitability of their operation.

One of the main considerations in grain production is the selection of the best adapted cultivar that will produce well within a given region.

OATS, BARLEY AND WHEAT

The regional tests of oats, barley and wheat are carried out to address this issue. The results of the tests do form the basis for provincial variety recommendations (Publication #296-Field Crop recommendations for Ontario) in test zone 5.

Our data either from New Liskeard, Verner, Thunder Bay or Emo is solely responsible for the variety recommendations in these part of northern Ontario. By adding Kapuskasing data the entire northern Ontario region is covered.

The best barley cultivar over the 2 year period was Chapais, followed by Joly.

In oats Marion and Ultima are producing well as long the BYD virus is not a problem. Var. Ogle has good resistance to the virus and therefore should be grown whenever the virus is a problem.

In Wheat, hard red spring wheat from western Canada continues to provide grain for high quality bread flour. The wheat crop has lost its lustre, since the millers are reluctant to pay premium prices for Ontario grown wheat. In fact the wheat growers feel very threatened from the suggested U.S. imports. As indicated earlier Durum wheats from western Canada have been doing fairly well at northern Ontario research stations. Time will tell what production impact will be created by this crop in Ontario.

It is conceivable that cereal producers, to save on production costs, will be using more home grown seeds than in the previous years.

SEED SIZE TEST

A cooperative project with Kapuskasing Research station is looking at seed size as it affects grain yields. Many articles in journals and magazines suggest that the use of quality seed improves the yield. Now we will have northern data to see how well it may work in our area.

Purchased certified seed of Chapais and Rodeo varieties were divided into the 4 groups; large, small, medium and as is (from the bag).

The first year data suggest that large seed produces higher yields. We were using similar seeding rates with all seed lots. If you want a higher yield, clean your seed lot well, the dividends will be greater.

NARROW VS. WIDE ROWS

As part of the intensive cereal production package the effect of sowing cereals in narrow rows has been studied in many countries.

In general, world literature suggests a 10% yield increase over the conventional wide rows. There are, however, reports that suggest no increase or only slight yield increase from narrow rows.

Over the past few years our research has indicated yield advantages of only between 3% - 8% for narrow rows. Kapuskasing station in their best years have obtained yield increases up to 14% when narrow rows were used. If you are buying a new seed drill this should be kept in mind.

TILLAGE

Some people would like to reduce the number of tillage operations in seed bed preparation for cereal production. We went to the absolute extreme, no tillage at all.

A stubble field was seeded with a no-till drill.
The results were quite encouraging, the overall yield was 3233 kg/ha. We do have some reservations, however, about this practice. Unless one has twitch grass clean fields and reasonably high soil fertility crop yields may not be high.

Growing the same kind of grain crop year after year may also increase the disease pressure on the crops and consequently lower grain yields.

OIL AND PROTEIN CROPS

In our tests with oil and protein crops, the sweet lupins showed higher yields than in the previous years, an average of 3313 kg/ha. Plenty of moisture during the later part of the summer probably was the main factor for a yield increase in the sweet lupin crop. The crop is very late maturing and we only hope that the plant breeders will develop earlier maturing cultivars.

CANOLA -

In canola tests, hybrid canola shows promise. It will take the plant breeders perhaps 2-3 years to select high yielding hybrid canola cultivars. During the 1990 growing season several Timiskaming farmers had the opportunity to compare hybrids with open pollinated varieties and their comments have been very favourable. The average yield for the test at NLCAT was 3192 kg/ha of clean seed.

FIELD PEAS -

In field peas 17 cultivars were tested. The average yield was 2646 kg/ha. The maturity date varied from 102 to 105 days.

SOYBEANS

In some areas of northern Ontario early cultivars of soybeans will soon become a crop to grow for protein supplement. In our test the yields varied from 1847 to 3277 kg/ha. The highest yielding registered cultivar was Maple Arrow at 2785 kg/ha.

LINSEED

No doubt you have heard that plant breeders are working hard to change the linseed plants to produce edible oil.

We have not tested these edible oil types. The industrial flax varieties had a rough time ripening under our fall conditions. It took about 132 days for varieties in the test to reach maturity but the yields were good from 1844 to 2301 kg/ha. When edible oil flax varieties will be available, I do not foresee a great rush to grow this oil crop. As long as the canola yields are higher and the price for the crop is right, there will be very few changes in crop acreages.

FORAGE CROPS -

Cultivar evaluation in our major forage species round out the research programs at NLCAT.

In orchard grass some advanced plant breeder lines show winter survival similar to the Kay variety.

Sonja white clover also appears to be hardy and should be available, once registered in Canada. The low alkaloid reed-canary varieties perform well and give improved animal gains.

SEED PRODUCTION STUDIES IN RED CLOVER

For a number of years farmers in Timiskaming district have complained about the poor seed crops of red clover.

Since the advent of plowdown of legume crops, red clover seed has become a desirable commodity and the demand for the seed is fairly strong.

In our research work we discovered a very destructive insect, the case bearing moth. Its larva destroys red clover florets and the developing seed in large numbers.

This insect, *Coleophora deauratella* has not been previously identified in northern Ontario. We do not have any insecticides for its control. Our advice is to cut the red clover for hay or for silage so that the insects life cycle is interrupted.

We are grateful to the Canadian Seed Growers Association for their financial contribution to carry out this study.

Ornamentals at Kapuskasing

Laurier Guillemette, Agriculture Canada
Experimental Farm, Kapuskasing, Ontario

Ornamental research in Northern Ontario is almost non existent except for the odd demonstration projects at few locations. In the earlier years of the Kapuskasing Experimental Farm, there was some ornamental research conducted and some of the results were presented in the station reports and other publications. More recently the farm has been collaborating with the Agriculture Canada Station of L'Assomption, Québec on a province wide project to evaluate shrubs and trees for ornamental purposes. In 1984, several sites were selected in the province of Québec and Kapuskasing as the only outside Québec location for representing the Abitibi region of the province. Because of the industries economic importance, a systematic experimental protocol was established with the following objectives in mind:

1. To obtain information on the behaviour of native and exotic species and cultivars which could be of ornamental value when produced under normal soil and climatic conditions of Québec.

2. To promote the selection and use of unknown and underutilized species and to develop new plant material which responds to the request of the trade.

3. To produce and distribute to the trade on a regular basis, efficient and pertinent information produced from these trials.

4. To use this information in order to support registration when required.

In order to fulfil these objectives, the evaluation process is divided into 3 distinct stages.

1. Pre observation trials

2. Intermediary trials

3. Observational trials

In the pre observation trials, many entries are evaluated at a few locations. These serve as a pre screening trial before entry into the more distributed intermediary stage.

The intermediary stage is the second level of testing which is conducted in every hardiness zones of the province. The duration of each planting last for five years where the plants are evaluated for their performance and hardiness. This is the level of testing the Kapuskasing Experimental Farm is involved. Every year 40 new species or cultivars are tested with 7 plants per plot replicated 3 times for a total of 21 plants of each entry. At this level, many observations are noted every year.

Here is a listing of these:

1. Winter survival
2. Opening of growth buds
3. Spring height
4. Spring width
5. Spring diameter of trees
6. No. of stems
7. Date of first flower
8. Date when 50% in flower
9. Flower odour
10. Date when flowering ends
11. Type of flower
12. Fruit
13. Date when fruits ripe
14. Gait
15. Hardening date
16. Date when 50% leaves fall
17. Fall height
18. Fall width
19. Fall diameter of trees
20. Fall no. of stems
21. Diseases
22. Insects

The Kapuskasing Experimental Farm's site is the most northerly testing site of all sites. Because of this, the amount of plants Winterkilled is somewhat higher than the other sites, however, some very interesting results have surfaced at our location. Certain species which were not expected to survive did surprisingly well and others which were expected to do better did not perform as they should have. Because of lack of space available in this summary, a complete listing will be presented at the conference with slides and comments.

The last stage of testing, the observational trials will last anywhere between 10 to 25 years where the plants will be observed under a permanent site for ornamental purpose suited to meet the demands of the consumers. These sites are to be selected in each regions to represent different soil and climatic conditions. Many municipalities, school boards, public parks and other public institutions have already agreed to participate at this level.

We hope that in time, this information will be a valuable tool to the ornamental trade and the consumers of Northern Ontario.

MULCHES AND ROW COVERS IN THE NORTH

Becky Hughes
Agronomy Section
New Liskeard College of Agricultural Technology

The use of plastic mulches, tunnels and floating row covers in horticultural crop production is increasing in North America.

MULCHES

Plastic mulches have been shown to increase soil temperature and moisture, reduce soil crusting and compaction, and reduce fertilizer leaching. Clear plastic mulches result in the greatest soil temperature increases, however opaque films prevent weed growth.

Many researchers have reported increased early and/or total yields and reduced time to harvest for direct-seeded and transplanted vegetables using mulches. The use of plastic mulches is said to facilitate the production of warm-season crops such as tomatoes, peppers and sweet corn.

Trials at the Agriculture Canada Research Station in Kapuskasing on wax beans, peppers, cucumbers, tomatoes and sweet corn showed yield increases between 25 and 162 percent when these crops were grown with a plastic mulch. These crops matured a few days earlier, had more uniform maturity, and greater size and weight when mulched.

SWEET CORN AND MULCH - A trial conducted in 1984, 1985 and 1986 with two sweet corn cultivars, 'Northern Vee' and 'Sugar King', planted at three different dates showed no effect of mulching on the number of days to harvest. In 1985, mulching increased the yield of 'Sugar King' an average 100% and that of 'Northern Vee' 20%. Mulching increased the yield of 'Northern Vee' by 22%, but had no significant effect on the yield of 'Sugar King' in 1986. In 1984, mulching only increased the yield of the second planting of 'Northern Vee'.

CUCUMBERS AND MULCH - Two cucumber cultivars, one an early-slicing cucumber (Spacemaster) and the other a pickling cucumber (Pioneer), were either direct seeded or transplanted on to bare ground or a photodegradable black mulch in 1987, 1988, 1989 and 1990.

In 1990, a plastic IRT (infrared transmitting) mulch was also used. IRT films are said to increase the soil temperature almost as much as clear plastic and still inhibit weed growth.

The results from the 1987 trial, showed a 45% increase in the yield (doz/ha) for 'Pioneer', but a non-significant 21% increase in yield for 'Spacemaster' when grown on mulch (Table 1). Mulching had no effect on the weight harvested per hectare in 1987.

The combined results for 1988, 1989 and 1990 showed that mulching had a greater effect on the yield of 'Spacemaster' than 'Pioneer' (Table 2). The yield (doz/ha) of 'Spacemaster' was increased by 61% while that of 'Pioneer' was increased by 42%. Mulching also increased the number of kilograms harvested per hectare for both cultivars over the three years (Table 3). The earliness of the crop was slightly increased by mulching.

The IRT mulch used in the 1990 trial did not improve the earliness of the crop or increase the yields. Other researchers have reported similar results with tomatoes, bell peppers, musk-melons and watermelons. However, a second brand of IRT mulch used only on one row of direct-seeded cucumbers appeared to increase yields when compared to the photodegradable mulch.

TABLE 1: Yields from the 1987 Cucumber-mulch Trial.

Cultivar	*Treatment*	*doz/ha*	*kg/ha*
Pioneer	No mulch	21491	2753
	Mulch	31072	2606
Spacemaster	No mulch	5598	5790
	Mulch	6763	4864

TABLE 2: Average yields (doz/ha) from the 1988, 1989 and 1990 Cucumber-mulch Trials.

Cultivar	*Treatment*	*doz/ha*
Pioneer	No mulch	29988
	Mulch	42546
Spacemaster	No mulch	6279
	Mulch	10099

TABLE 3: Average yields from the 1988, 1989 and 1990 Cucumber-mulch Trials.

Year	Treatment	Cultivar	kg/ha
1988	No mulch	Pioneer	3161
		Spacemaster	6566
		Average	4864
	Mulch	Pioneer	3142
		Spacemaster	8833
		Average	5988
1989	No mulch	Pioneer	29416
		Spacemaster	14483
		Average	21950
	Mulch	Pioneer	46352
		Spacemaster	35766
		Average	41059
1990	No mulch	Pioneer	21988
		Spacemaster	17795
		Average	19892
	Mulch	Pioneer	32738
		Spacemaster	30121
		Average	31430

FLOATING ROW COVERS

Floating row covers are relatively new to horticulture. These lightweight covers, composed of spunbonded polyester (Reemay), spunbonded polypropylene (Kimberly Farm Covers and Agryl) or polyamid plus polypropylene (Agronet), float on top of the crop requiring no other support. They are available in widths of 64" to 48' and lengths of up to 2500'.

These covers are said to provide some frost protection, increased daytime air temperatures, increased soil temperatures, protection from insects and wind and increased soil moisture. These conditions should result in faster germination, more rapid growth, and earlier and larger yields. Floating row covers are recommended for the production of the cole crops, lettuce, spinach, radishes, beans, carrots, onions, potatoes and strawberries in Quebec, and the production of cucumbers, squash, peppers, tomatoes and sweet corn in warmer areas. The covers should be put on at planting and taken off three to ten weeks later depending on the climate and crop. They can be used with or without a mulch. As they provide some frost control, planting can occur up to two weeks before normal. Row covers can also be used to extend the growing season in the fall and to overwinter strawberries and nursery crops.

SWEET CORN AND FLOATING ROW COVERS - In 1990, two sweet corn cultivars, 'Northern Vee' and 'Seneca Horizon' were planted with or without a floating row cover (Kimberly Farm Vegetable Cover). The cover was removed after six weeks. Although the row cover had a significant effect on the vegetative growth of the corn, it did not increase the yield (Table 4). Using the row cover did reduce the time to 25% harvest by 10 days for 'Seneca Horizon'. Similar results have been reported by other researchers.

STRAWBERRIES AND FLOATING ROW COVERS - 'Veestar' was planted in the spring of 1989 and covered with two weights of floating covers (Kimberly Farm Vegetable Cover - 0.6 oz/yd^2 and Kimberly Farm Strawberry Freeze Cover - 1.5 oz/yd^2) in September of 1989. The covers were removed the next spring when 10% of the blossoms were open. Theoretically, applying the cover in the fall promotes flower bud formation giving greater yields the following year. Having the row cover on during the winter provides protection from low temperatures and desiccation. In the spring, the cover provided some frost protection, and promotes earlier growth and flowering giving earlier yields.

At NLCAT, the use of floating row covers on strawberries in 1990 did not significantly increase the yield. However, they did decrease the time to 25% harvest by an average of 13 days (Table 5). The berries from the covered trials tended to be smaller and showed signs of poor pollination.

The success of mulches, floating row covers and tunnels in 'the north' will depend on their ability to increase yields and earliness enough to compensate for their high costs. Research into the use of the materials is continuing in Kapuskasing and at NLCAT.

TABLE 4: The effects of floating row covers on sweet corn (1990 data).

Cultivar	Treatment	Yield (doz/ha)	Plant height (cm)	Days to harvest (1=Aug 1)		Harvest duration
				25%	50%	
Northern Vee	Control	5193	55	8	13	24
	Covered	4873	88	8	8	13
Seneca Horizon	Control	5353	63	20	22	18
	Covered	5578	92	10	11	20

TABLE 5: The effects of floating row covers on the strawberry 'Veestar' (1990 data).

Treatment	Yield (tonnes/ha)		Days to harvest (1=July 1)		Berry weight (g)
	Total	Marketable	25%	95%	
Control	7.9	7.8	33	47	6.7
Vegetable cover	9.8	9.5	21	35	5.4
Freeze cover	7.3	7.1	19	32	4.5

AN UPDATE ON GATT
BILL MITCHELL
ASSISTANT DIRECTOR OF BOARD/INDUSTRY RELATIONS
THE ONTARIO MILK MARKETING BOARD

The December Ministerial meeting of the GATT in Brussels did not achieve a completion of the negotiations, as conceived originally more than four years ago.

It must first be understood that much progress was achieved in Brussels in most of the Negotiating Groups. The 15 Negotiating groups were regrouped into 7 negotiating tables with an eight group reviewing the overall progress. It appears that most other areas of the GATT negotiations can be resolved relatively quickly should an agreement be reached in agriculture. In other words, the agriculture negotiations are holding back agreements in all other sectors.

The difficulty in agriculture "appeared" to be the unwillingness of the European Community to make specific reduction commitments in each of the three key areas of the negotiations: export subsidies, market access and internal support measures.

While the meeting in Brussels was not successful, it did provide some insight into the areas of potential agreement as well as those areas which remain sensitive. The highlights coming out of the meeting were:

* A consensus now appears to exist that commitments will need to cover all three areas of the negotiations.

* The EEC is clearly under pressure to reduce its subsidized exports and increase its imports of agricultural products. It may not accept the same amount of movement in all three areas. It may, for example, make a commitment in reducing export subsidies while offering a conservative increase in market access.

* A new element to address EEC concerns is to reduce export assistance by reducing the total volume of exports eligible rather than reducing subsidy levels.

* There seems to be significant support for an overall minimum access commitment. Indications are that a minimum level of access may be in the 3 to 5 per cent range.

The critical issues which still need clarification are:

* Credits for action taken since the beginning of the Uruguay round are sought by the EEC. This would have large implications for the dairy sector since quotas were introduced (1984) and production is down about 15 per cent.

* The EEC wants the right to re-balance trade in areas which currently have little protection.

* The critical issue of defining export subsidies. The U.S. has avoided advancing a clear definition. The EEC is asking that U.S. deficiency payments be considered an export subsidy.

* There are signs that the EEC may be considering reforming its agricultural policies on internal support towards providing income support rather than commodity price support. This may raise the issue of the need to decouple internal support.

Most experts did not expect this December meeting to end the negotiations in agriculture but were hopeful that a clear direction could be agreed to by Ministers to complete the negotiations in the early part of 1991.

Canada's position at the negotiations has been firm and centred on the following elements:
* New trade rules must apply equally to all countries.
* 50% reduction in trade distorting subsidies.
* Cut tariffs by one-third, with a 20% ceiling.
* Convert all import barriers to tariffs, except those allowed under Article XI, and cut them by half with a 20% ceiling.
* Allow imports of supply-managed products of up to 5% of Canadian production.
* Clarify and strengthen Article XI. (Supported by Japan, Europe and Nordic countries).

Negotiations have been proceeding with Arthur Dunkel, Director General of the GATT, responsible for the process. It had been hoped that the process might cool down by moving discussions from the ministerial level back into the hands of the negotiators.

Without reporters, TV cameras and demonstrating farmers, Dunkel hoped to gain progress in consultations with key players in the negotiations. The background for this process was strong pressure provided by the March 1 deadline for the U.S. fast track authority to achieving final resolution during February.

The U.S. has long been used to winning with these sorts of tactics. Perhaps the "new world order" U.S. President Bush refers to already exists in terms of world trade and the Americans have failed to notice. Another obvious factor is that the war in the Persian Gulf has changed international priorities.

The public may be beginning to see through superficial media coverage which falsely portrays the GATT situation as one in which the U.S. wants no barriers to trade and no subsidies and the EEC is fighting against the U.S. This propaganda has worked well but the real fact is that the U.S. has few peers when it comes to using trade barriers and subsidies. They have little intention of giving up much in these negotiations.

Regardless of how you view the causes, the bottom line is that the Economic Community did not blink first in the GATT game and the game continues.

A GATT meeting in Geneva on February 2 and 3 saw Dunkel bring together negotiators from the EC, U.S. Japan and the Cairns Group. The move was to see if there was enough flexibility to restart the talks.

The EC took an active role and tried to convince the other players that talks should restart and move quickly with the hope of ending negotiations by the end of February. Others resisted this move.

U.S. Trade Representative Carla Hills, appearing before the Senate Finance Committee of the U.S. Congress on February 5, formally informed Congress that the Bush administration was asking for an extension of the "fast track" authority for the Uruguay Round. A two-year extension of the fast track is now seen as likely.

The U.S. move to extend the fast track has changed the complexion of the negotiations and we will have to wait for the political hands to be played out as the process continues.

Milkhouse Waste Disposal

Harold K. House, P.Eng.,
Agricultural Engineer
Ontario Ministry of Agriculture and Food

North Eastern Ontario Agricultural Conference
February 26, 1991.

Ontario has legislation prohibiting the contamination of streams and water supplies. Milkhouse and milking parlour waste is a pollutant. It is not acceptable to drain this waste onto the surface of the ground, nor to connect it by underground drainage systems to an open ditch, creek or river. Acceptable systems provide proper storage, treatment and disposal of milkhouse washwater.

The amount of washwater produced varies greatly from farm to farm and does not necessarily bear any relationship to the number of cows milked. Observations have shown variations from 0.25 to 2 ft^3/cow/day (1½ - 12 gal/cow/day). On average, tie stall operations with a pipeline will produce ½ ft^3/cow/day (3 gal/cow/day) and a free stall operation with a parlor will produce 1 ft^3/cow/day (6 gal/cow/day). In order to ensure that a system is properly designed a reasonably accurate measure of the washwater volume produced daily should be made.

The following systems are satisfactory:

1. Adding Milkhouse Wastes to Manure or Runoff Storage System

The best system for milkhouse wastes is to add them to liquid manure or manure runoff storages when they already exist or when they are being constructed (Figure 1). The storage should be increased in size to allow for the added volume.

To meet requirements of the Agricultural Code of Practice and most grant programs, it is suggested that the storage have adequate capacity to handle at least 200 days of production. Concrete storages are the most common system for handling the wastes. If soil conditions are adequate (i.e. clay content high enough), earthen storages are a lower cost alternative.

The addition of the milkhouse wastes will add very little fertility value to the manure. It will, however, dilute the manure. If an irrigation or a hose injection system is used for application, this dilution is often ideal to reach the minimum moisture content for "pumpability".

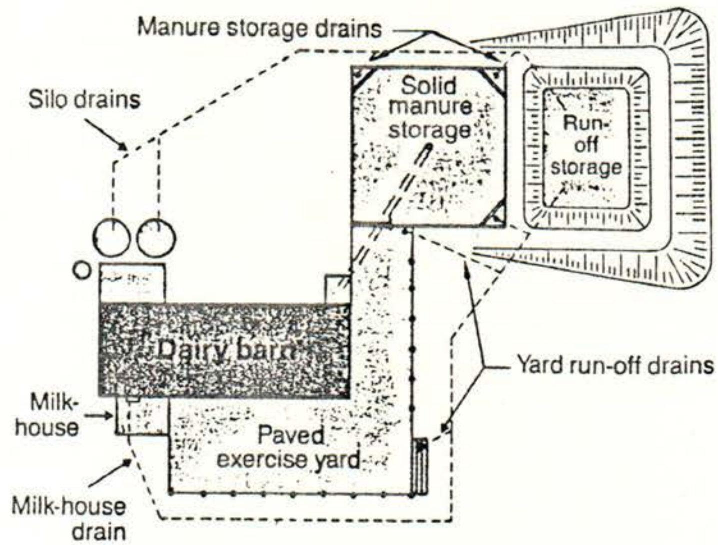


Figure 1 Adding Milkhouse Wastes to Manure or Runoff Storages

2. Storing Milkhouse Wastes in a Separate Storage

Milkhouse wastes and washwater may be collected and stored in a covered tank, a fenced open tank, or in a fenced earthen storage separate from any manure or runoff storage (Figure 2). A minimum 200 day storage period is required, but a longer storage period will provide easier management.

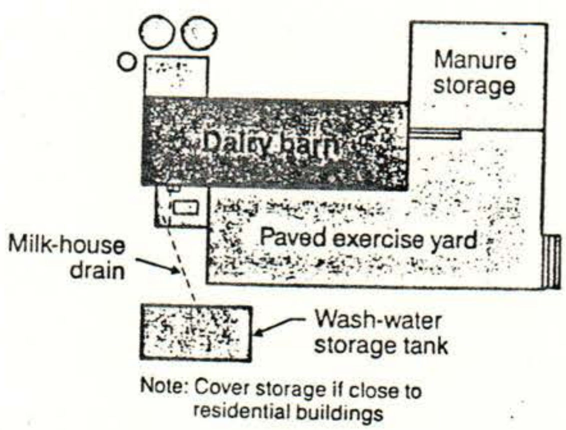


Figure 2 Storing Milkhouse Wastes in a Separate Storage

The minimum size of storage should be 4,800 ft^3 (30,000 gal) for a herd of up to 50 milking cows. For larger herds the size of storage should be based on a minimum of ½ ft^3/cow /day (3 gal/cow/day).

Milk waste can give off offensive odours during warm summer weather. It is wise to locate open storages at considerable distances from neighbours' dwellings and from the farm family's living area.

Concrete storages are the most common. Earthen storages can be considered if soil conditions are adequate (i.e. clay content high enough). However, on very small storages the percentage of storage used to contain precipitation will be very high, increasing application costs.

The wastes are generally applied to the land base twice per year. Fertility values are quite low, thus the major goal of application is to ensure that no runoff occurs into surface watercourses.

3. Handling Milkhouse Wastes in a Sediment Tank & Stone Filled Treatment Trench System

A sediment tank and stone-filled treatment trench system (Figure 3) is a third method of handling and disposing of milkhouse wastes. It consists of a sediment tank for allowing the settling of manure or dirt that is washed down drains, and a stone-filled treatment bed. The treatment bed helps to remove contaminants from the milkhouse and milking parlor washwater and improves the quality of the effluent that drains out into the surrounding soil.

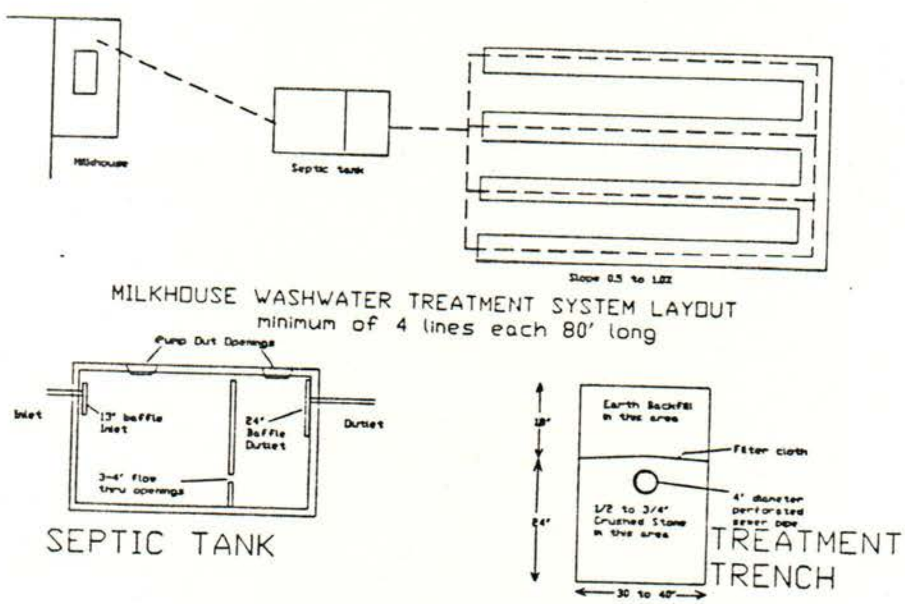


Figure 3 Sediment Tank and Stone Filled Treatment Trench System

This system should be used only in very open soil types which have internal drainage characteristics equivalent to a Guelph loam soil or better !! A Guelph loam soil is likely to have a percolation rate of 1 inch in 10 minutes. Where finer soils exist, the options described under system 1 or 2 should be used. It is extremely important that the details of design for this system be closely followed if it is to work satisfactorily, even in coarse soils. If there is a question about the suitability of a soil type a soils report should be consulted, and/or a percolation test should be done.

The sediment tank must be large enough to retain the wastes until the solid particles can settle out, and to provide space for 6 months or more of accumulated sludge. An approved 130 ft^3 (800 gal) 2 compartment septic tank should provide ample space for herds of up to 50 cows. For herds of 50-100 cows, use a 160 ft^3 (1000 gal) tank. For herds larger than 100 cows, a disposal system as described in options, 1 or 2 should be used.

Both inlet and outlet pipes to and from the sediment tank must be fitted with a vertical tee to vent the pipes and prevent blockage with floating material.

The disposal field includes sewer pipe and treatment trenches. Use sewer pipe from the sediment tank to the treatment trenches. Wherever this pipe goes under a roadway, replace it with galvanized steel pipe to prevent damage due to heavy vehicles or frost.

The treatment trenches should be excavated with a backhoe in parallel lines at least 8 ft on centre. Use an even number of trenches not over 100 ft, and preferably only 60 ft. in length. Excavate 40 inches wide and at least 36 inches deep. Partly fill the trenches to a depth of 24 inches with screened crushed stone, 1/2 - 3/4 inches size, to make an aerated treatment bed. Slope the bed uniformly at 1:200 to 1:100 towards the remote end. Note that wherever a high water table, impervious subsoil or bedrock is less than 5 ft below the ground surface, special elevated treatment trenches may be necessary to prevent groundwater pollution.

Use 4 inch diameter perforated sewer pipe. Lay pipe in the treatment trenches and connect it to the header pipes at both ends to make a closed loop system. Alternatively, you can use perforated clay field tile. <u>DO NOT use plastic drainage tile as the perforations are not large enough and will quickly become plugged</u>. Lay the pipe at the uniform slope with the holes in both sides of the pipe about 60° from vertical, not downwards as this could cause plugging or uneven loading of the trench with waste water. Add more crushed stone to provide 2 inches of cover on the pipe and a layer of geotextile fabric to keep soil out of the stone bed. Then backfill to the top of the trench with the excavated top soil.

Locate the sediment tank and disposal field on well-drained ground not subject to flooding from field runoff or roof drainage, but on lower ground than nearby wells. Make sure that the tank and disposal unit are at least 150 ft away from dug wells and 50 ft. away from drilled wells which have over 25 ft of casing. The treatment trench area should be fenced to keep heavy traffic and livestock from damaging the system.

The minimum sized treatment trench system recommended is four lines of trench each 80 ft long for a total of 320 ft. This size of system should be satisfactory for herds of up to 50 milking cows based on an average waste water output of 0.6 ft^3/cow/day (4 gal/cow/day). If the number of cows is more than 50 increase the trench length by 4 ft. per additional cow. If the quantity of waste water produced is much more than 0.6 ft^3/cow/day (4 gal/cow/day) the trench length should also be increased accordingly. For example, milking parlour systems are likely to use 1-2 ft^3/cow/day (6-12 gal/cow/day), therefore, the treatment trench will require 1½ - 3 times the length required for a similar sized herd in a tie stall barn.

Make your sediment tank and treatment bed large enough to accommodate any foreseeable future herd expansion. It is always wise to provide more treatment and disposal tile than the minimum recommended. These treatment systems should be installed by contractors who are licensed to install septic tank systems.

Notes:

a) Waste milk, milk from treated cows or waste colostrum should never be disposed of through the sediment tank and treatment trench system. This system is not designed to "treat" milk. Large quantities of waste milk should be disposed of by spreading on the surface of the land where runoff will not occur. In the event of a milk spill the sediment tank should be pumped out and field spread immediately.

   Ideally the first rinse cycle composing of a high percentage of milk should be used for feeding of calves, etc. and not be allowed into the sediment tank and treated trench system.

b) DO NOT wash manure from the milking parlour into the sediment tank, as this could completely fill the system with solids in a week or less. Shovel all manure solids into manure alleys or gutters of adjoining barns before washing walls and floors into the waste system. If you want to wash all wastes from the milking parlour through the floor drain system, connect the system to a liquid manure storage tank with extra storage to accommodate this method of disposal.

c) Do not dispose of human wastes through any of the three systems. If a toilet is to be installed, it must be connected to a separate septic tank system that has been approved by local health officials before construction.

d) Alternate detergents and cleaning strategies are being tried and in the future they may reduce the pollution potential of milkhouse wastes.

Three methods for disposing of milkhouse wastes have been described. All will work well, if managed properly. The choice of the best system will depend on your present operation and future plans.

FEEDING SYSTEMS

CONTRIBUTED BY :BRIAN BELL
DAIRY/BEEF SPECIALIST
OMAF,SAULT STE. MARIE

An ideal feeding system for the modern dairy operation must include the following features:

1) Delivers a balanced dairy ration to each individual cow dependent on her production, body condition score and physiological status.

2) One that can monitor consumption on individual cows so that frequent ration adjustments can be made based on intake.

3) Will accommodate any number and type of feed that is currently available, for example, dry hay,pasture, ensiled forages, grain, grain and protein by-products, protein supplements, minerals and additives.

4) The system will take advantage of proper blends of ingredients to maximize rumen fermentation and increase digestibility.

5) Maximizes intake on the most efficient use of lower cost roughages.

6) Does all of the above with considerations for labour,capital outlay,maintenance and operating costs.

The unfortunate part is that there is "no" perfect system. Feed delivery systems now available impart at least some of these characteristics. Considerations must be given to existing housing facilities, feeds available, labour,herd size, productivity, and crop production management.

TMR's(total mixed rations),individual grain feeders and CCF's(computer concentrate feeders) are increasing in use throughout the province. As detailed below, both systems have pluses and minuses.

CCF

Advantages include:

1) Delivery to each individual cow of concentrate related to her specific requirement.
2) The amount fed can be measured.
3) Frequency of meal feeding. Although a topic of debate, there is evidence that multiple feedings do have advantages(stable rumen ph, for example)

4) Target cows can be fed according to particular production goals- ie) early lactation fat feeding.
5) Gradually increase or decrease the amount of concentrate feeding.
6) Help prevent wasteful feeding since the cow only gets what she needs. No more, no less.

Disadvantages include:

1) Feeding is still based on a '"guesstimate" of forage intake.
2) Rations should be for individual cows.
3) Frequent calibration is necessary to adjust intake based on condition, age, stage of lactation.

TMR

Advantages include:

1) Increase of dry matter intake.
2) Frequent small feedings.
3) Overall better cow health(acidosis,off-feed)
4) No free choice minerals.
5) Minimize butter fat depression due to stability of rumen ph.
6) More diverse feedstuffs can be used such as by products, urea.

Disadvantages include:

1) Cow movement by group.
2) Tail end cows can become over conditioned.
3) Extra labour for blending of feeds and moving cows.
4) Capital costs can be high for mixing and weighing equipment.
5) Further processing of some ingredients may be necessary before blending in the ration

Irregardless of the type of system,the following must be considered before purchase:

1) Service
2) Time required for mixing.
3) Payback- where from?

MANURE STORAGE

Dr. S.F. Barrington
Agricultural Engineering Department
McGill University, Macdonald Campus

In this modern age of environmental awareness, manure management has become a target issue. Improper handling and storage of manures, as well as over-spreading on tillable land, are management issues which have been related to the deterioration of the quality of surface as well as underground waters. Agriculture, as all other industries, must therefore place some importance on the clean management of its wastes.

Proper storage of manures involves the design of a facility which will be:

1) practical to fill and empty

2) seepage free or solidly built

3) of sufficient capacity to hold all manures and waste waters produced between land disposal operations.

The Ontario Ministry of Agriculture and Food, as well as all other Provincial Ministries of Agriculture, offers planning services for the design of manure storage facilities: often these facilities must be adapted to individual needs. Manure storages have been thoroughly tested and are now demonstrated as practical.

Storage facilities should also be designed to provide for as little manure seepage as possible. The level of seepage which one may expect from manure storages is often a matter of capital investment. This is true as much when earthen and concrete facilities are compared as when concrete structures are compared among each other. Earthen structures require one quarter to half the investment involved for a concrete storage, but can be expected to seep at a rate of 50 to 150 mm/yr (2" to 6"/yr). Concrete facilities should leak at a rate well under 50 mm/yr (2"/yr) but cost two to four times as much as an earthen storage. Nevertheless, this seepage rate is achieved only if the concrete tank is well designed and built of high quality materials. Ice pressures, low safety factors and poor workmanship are the three (3) main sources of concrete structure cracking. Often these cracks are not obvious and can lead to seepage rates as high as those experienced with earthen structures. In order to get one's money's worth out of concrete storages, a consulting engineer should be hired. At a cost representing approximately 50 to 10% of that of the structure, he can design a solid facility and ensure good quality construction.

The capacity of the storage structure is also crucial, especially if a reinforced concrete facility is built. Again, professionals working with Provincial Ministries are in a position to help recommend sizes. Storage periods under 240 days are not recommended. Rather, manure structures should be designed to hold the waste accumulation of 300 to 365 days.

Table 1. Manure storage and handling costs for a herd of 65 dairy cows with young stock.

Handling Method	Storage System	Costs - $ / cow / year: Investment	Handling	Disposal	Total
1. LIQUID SYSTEMS					
Gravity	Earth	73	5	70	148
Pump	Earth	76	78	70	153
Pneumatic	Earth	103	8	70	181
Gravity	Concrete	169	5	67	241
Pump	Concrete	171	8	67	246
Pneumatic	Concrete	199	8	67	274
2. SOLID SYSTEMS					
Stacker	Con/Earth	156	8	72	236
Pneumatic	Con/Earth	178	8	82	268
Stacker	Concrete	176	8	72	256
Pneumatic	Concrete	204	8	82	294
Pneumatic	Con/Cover	211	8	53	271
Pneumatic	Gravel/Cover	74	8	53	135

Note:
- All equipment cost is capitalized over 10 years at 12% with no residual value.
- All structure's cost is capitalized over 30 years at 10% with no residual value.
- These costs all pertain to a stanchion barn.
- The cost of electricity is 0.06 $/kW-h.
- A septic tank system is included in the cost analysis of the solid manure systems using a cover.
- All costs are typical of the Province of Quebec and are taken from C.R.E.A.Q. 1989.
- For solid systems, the storage facility "con/earth" implies a platform with compacted earthen walls and a concrete floor; the term "con/cover" implies a concrete platform with a geotextile cover while the term "gravel/cover" implies a gravel floor with a geotextile cover.