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**INCREASING THE PRODUCTIVITY
OF LAND RESOURCES IN NEW YORK'S
NORTH COUNTRY:**

A STUDY OF FARMERS' DRAINAGE PRACTICES

by
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PREFACE

The Agricultural Water Management Program at Cornell University was instituted to provide opportunities for increased farm productivity through better water management.

Many farms in the State have productivity limitations imposed by excess soil water. These soil wetness conditions have been recognized in the past, usually on an individual farm basis. Current technology is generally adequate to solve such individual farm problems, if suitable drainage outlets exist. Large areas of the State do not have suitable outlets.

The Agricultural Water Management Program has undertaken the task of implementing better water management by establishing institutional arrangements to provide suitable drainage outlets. The "North Country" was selected as an initial area of emphasis.

This study of farmers' drainage practices was done to assist the Agricultural Water Management Program in establishing appropriate institutional arrangements. This study documents farmers past and current practices, and their future drainage plans, and will provide comprehensive data for the Agricultural Water Management Program.

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INTRODUCTION

THE IMPORTANCE OF DRAINAGE IN THE NORTH COUNTRY

New York's North Country consists of nearly two million acres and is the third largest agricultural area in New York, occupying 8.7 percent of the state's agricultural land (Hardy, 1969). It is also one of the most specialized. Over 85 percent of the farms are classified as dairy (Conneman, 1968). Soil resources in the North Country (such as Pantton, Vergennes, and Livingston soil series) are generally regarded as adequate for production of crops associated with dairying, yet poor drainage of pasture and cropland can impose constraints on production (Pederson, 1962; Thiam, 1967; USDA, 1975; USDA, 1976). It has been estimated that as much as 74 percent of the land under pasture and 54 percent of cropland is in need of drainage (Thiam, 1967).

It should be noted that poor drainage is only one of many factors contributing to the relatively low level of agricultural productivity. Other factors include climate, location, and income and management abilities of the farmers themselves. Indeed, even when drainage is installed in poorly drained soils, it is the management abilities of the farmers which determine to a large extent, whether or not the full benefits of drainage will be realized. However, farmers are usually willing to manage their farms to take full advantage of the drainage (e.g., planting corn early, applying adequate amounts of fertilizer, etc.).

Potential benefits resulting from drainage include: a lengthening of the growing season, since fields can be worked earlier in the spring, the promotion and growth of beneficial soil bacteria activity, which can improve the tilth of the soil; and increased capacity of the soil to absorb

water, resulting in less runoff and, thus, less erosion; increased ease of working the fields; improved hay quality (larger percentage of legumes in haystands); reduced heaving of deep-rooted crops; and increased soil aeration (Zwerman, 1969; Swader et.al., 1971; Logan and Bone, 1974; Aldabagh and Beer, 1975).

In particular for North Country farmers, an increase in the use of drainage might result in a smaller proportion of farmland in hay and pasture, a larger proportion of total hay acreage in alfalfa and alfalfa mixtures, a larger proportion of cropland in corn, higher forage and grain yields,¹ an increase in the longevity, growth, and quality of legumes and grasses, increased efficiency in the use of fertilizers, and better chances for a timely planting in the spring and a successful harvesting of mature plants in the fall (Lucey and Pardee, 1968; Zwerman, 1969; Coote, 1969; Willardson, 1974; Bagley, 1976).

Although there are many benefits resulting from drainage, the costs must also be noted since drainage may represent a considerable economic investment for the individual farmer (Found et.al., 1976). There is evidence, though, that farmers in New York State are willing to make this investment. In the five year period alone, 1969-1974, New York State's Soil and Water Conservation Districts (SWCD) have been involved in the installation of approximately 485 km (300 miles) of diversions; 2,735 km (1700 miles) of drainage ditch and 5,792 km (3600 miles) of tile drain (Swader, 1977). These figures reflect the effort farmers have been willing to put into removing excess water from their cropland.

¹Currently, North Country forage and grain yields are below the state average (NYSCRS, 1977; NYSCRS, 1978).

PURPOSE OF THE STUDY

The purpose of this study was twofold: (1) to provide estimates of surface and subsurface drainage work on North Country dairy farms, and (2) to provide estimates of future drainage work planned. In addition, the farmers' attitudes towards drainage (including problems with installation, effectiveness of the drainage installed, etc.) were investigated. It was hoped that this information would be particularly useful to men and women involved in future agricultural extension and drainage work in the North Country.

METHODS

Dairy farmers in St. Lawrence, Franklin, Clinton and Essex counties were sampled for a survey by obtaining their names from county offices of the Agricultural Stabilization and Conservation Service (ASCS). The sample size was 273 dairy farmers (the total number of dairy farmers in these counties was 2,837). This figure was calculated using estimates for the population variance of key variables and assuming that 35 percent of the ASCS lists would be ineligible (i.e., they were no longer in farming) and that the response rate would be 90 percent.

A questionnaire consisting of specific questions on farming and drainage practices was used to obtain the data. The questionnaire was pretested twice in 1977, and was finally administered in January and February of 1978 by Cornell University students, who had previously undergone interviewer training.

Information was also obtained from interviews conducted with ASCS and Soil Conservation Service (SCS) personnel in these counties. Information

obtained included problems farmers were encountering in planning and installing drainage, characteristics of farmers installing drainage, and attitudes of farmers towards the cost-sharing program.

Data obtained from the SCS offices in St. Lawrence and Franklin counties were checked against information from 44 of the sample survey farmers. For all cases the drainage information from the survey corresponded with SCS records and in 93 percent (41/44) of the cases, the soils information matched.

Out of the total number of sample farm operators (273), 115 (42 percent) were ineligible. Of the 158 remaining farmers, 21 (13 percent) refused to be interviewed. The response rate was thus 87 percent (137/158) and the completion rate, 50 percent (137/273).

Although the response rate was relatively high, data on two variables (farm acres, crop acres) were also obtained from the 21 farmers who refused to participate in the survey. These data indicated that those farmers who refused to be interviewed did not differ significantly on those measures from those who were interviewed.

From the values obtained in the survey, population estimates were then derived. The analysis consisted primarily of determining the distributional characteristics of variables. The analysis was mainly descriptive, summarizing pertinent information obtained from each farmer and comparing it with data from other farmers and SCS and ASCS personnel, as well as statewide data.

RESULTS AND DISCUSSION

Description of the Farming Population

The distribution of the sample farms by county is given in Figure 1, with 79 in St. Lawrence, 28 in Franklin, 24 in Clinton and 6 in Essex county. The farmers who participated in the survey were, for the most part, full-time operators (72.3 \pm 7.8 percent) who had been operating dairy farms for at least 10 years.

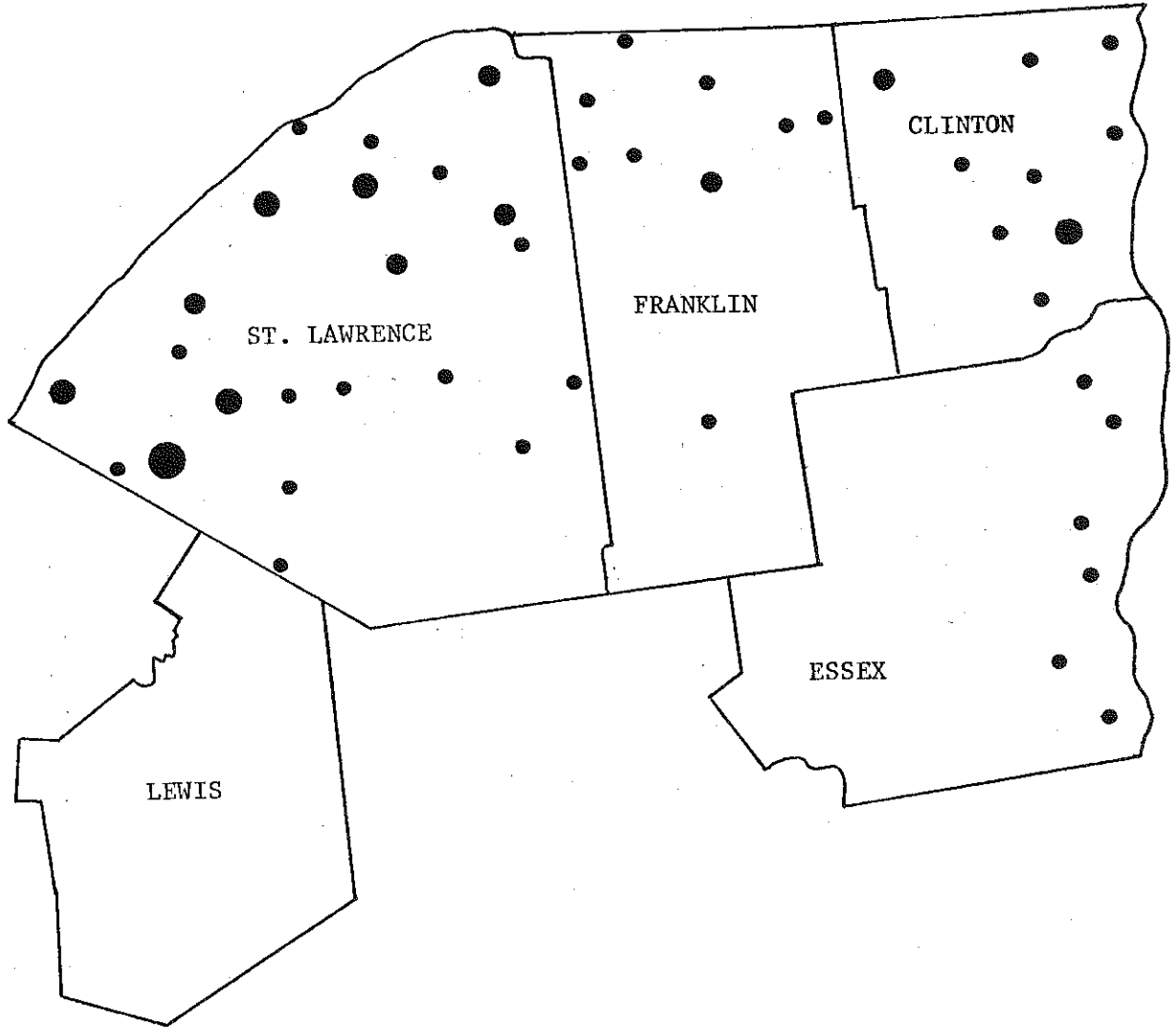
The area has traditionally been a hay-growing region; as recently as 1976 and 1977 the hay acreage was about three times that in corn silage (Table 1). Hay is the preferred field crop in the area, since it does not have to be reseeded each year. In fact, the average length of time a hay stand remained unplowed was found to be 7.4 (\pm .6) years.

Although there was a trend towards mechanization and modernization in the area, a large percentage of farms still had bucket-and-carry milking systems and main dairy barns over 40 years old. The average herd size of these dairy farms was 51.4 (\pm 5.1) cows; the average yield for the herd was 4,905.6 \pm 233.1 kg of milk (or 10,805.2 \pm 513.5 pounds of milk) per cow per year.

Present Drainage Practices

Most (88.3 percent \pm 5.5) North Country dairy farmers indicated problems with poor drainage in their fields. The most commonly reported were: getting on the land in the spring and at harvest time in the fall; being stuck in the fields with equipment; and harvest losses. Nevertheless, many (56.9 \pm 8.5 percent) of the farmers classified the drainage of most

FIGURE 1. DISTRIBUTION OF SAMPLE SURVEY FARMS.



LEGEND:

- Approximately one to five farms
- Approximately six to 10 farms
- Approximately 11 to 15 farms
- Approximately 16 to 20 farms

TABLE 1. CHARACTERISTICS OF CROP OPERATIONS, 137 NORTH COUNTRY DAIRY FARMS, 1976 AND 1977.

	Hectares	Acres
Cropland operated	83.5 ± 8.9	206.1 ± 22.1
Cropland owned	63.1 ± 8.1	155.7 ± 19.9
Total land owned	125.7 ± 15.4	310.3 ± 38.0
<u>Hay</u>		
Land area	44.7 ± 4.8	110.4 ± 11.8
Yield	4.0 ± 0.2*	1.8 ± 0.1**
<u>Corn silage</u>		
Land area	16.4 ± 3.2	40.5 ± 7.9
Yield	22.0 ± 2.5*	9.8 ± 1.1**

* tons/hectare

** tons/acre

of the soil on their farms as well or moderately well drained. According to county ASCS staff, these farmers were not used to working with well drained soils and so they tended to rate their soil drainage as high.

Eighty percent of the farmers reported that they had surface or subsurface drainage on their property (Table 2). Most of the reported drainage was surface drainage, with surface-drained acreage outnumbering tile-drained acreage three to one. For the tile drainage, 56.0 (+ 8.5) percent was relatively new, less than 10 years old and almost all (98.0 ± 2.4 percent) was on the operator's property (as opposed to rented land). Many farmers (86.0±6.0 percent) rated their drainage system as in an excellent or good state of repair, and 68.3 (+ 8.0) percent reported that they did no maintenance, presumably because most of the drainage systems were in good working order.

For surface drainage, 74.0 (+ 7.5) percent was relatively old, over 10 years old, and 88.0 (+ 5.5) percent had been installed on the operator's property (the rest had been installed on rented land). Less farmers (54.0 ± 8.6 percent) rated the drainage system as in an excellent or good state of repair compared to tile, and 68.3 percent (+ 8.0) reported that they did do some maintenance, including cleaning and/or mowing. This last figure was in contrast to that for tile drainage where 68 percent of the farmers reported that they did no maintenance. Part of this difference was due to tile drainage requiring less maintenance than surface drainage and to the surface drainage being relatively old compared to the tile drainage.

Future Drainage

About 66 percent of North Country dairy farmers indicated that they were planning to install drainage in the future. Although currently, three

TABLE 2. CHARACTERISTICS OF PRESENT LAND DRAINAGE PRACTICES, 137 NORTH COUNTRY DAIRY FARMS, 1976 AND 1977.

	%	
Farmers reporting problems with poor drainage in fields	88.3 (± 5.5)	
Farmers classifying land drainage as well to moderately well drained	56.9 (± 8.5)	
Farmers with surface or subsurface drainage reported	80.3 (± 6.8)	
	Drainage	
	Tile %	Surface %
Less than 10 years old	56.0 (± 8.5)	26.0 (± 2.3)
Installed on operator's property	98.0 (± 2.4)	88.0 (± 5.5)
Drainage systems rated in "excellent" or "good" state of repair	86.0 (± 6.0)	54.0 (± 8.6)

times as much acreage has surface drainage as compared to tile drainage, in the future tile-drained acreage will increase relative to surface-drained acreage.

Regarding the cost-sharing program, 93.0 (+ 4.4) percent of farmers installing tile reported that they would be applying for cost-sharing funds compared to 76.0 (+ 7.3) percent of farmers installing surface drainage, a difference that is a reflection, in part, of the greater expense of sub-surface drainage projects.

Attitudes Towards Drainage

Most farmers surveyed were pleased with the drainage on their farms -- either drainage they had installed or drainage that had been on the farm when it was purchased. The main advantages of drainage given by these farmers were that drainage, (1) enabled them to get on the land earlier in the spring, (2) "created" more farmland (allowed more land to be brought into production), thus they could grow more crops, (3) allowed them to grow more alfalfa and/or corn, and (4) resulted in less problems with equipment being stuck in the fields. Most farmers preferred tile drainage (61.1 ± 8.4 percent) to surface drainage, since, according to those farmers who expressed a preference for tile, tile drainage was easier to maintain, easier on equipment, and less expensive.

The sample survey estimates given for the amount of future drainage work in the North Country were for planned drainage. Whether or not the farmers actually do install the drainage remains to be seen. Interviews with the farmers, SCS and ASCS personnel indicated that a considerable number of

farmers may not be convinced of the benefits and importance of drainage. Either those farmers have adapted to working with poorly drained soils and/or they perceived other problems in the dairy business (e.g., depressed prices, over-investment in machinery and equipment) to be more important. Indeed, one-third of the farmers surveyed were not planning to install drainage in the future.

Problems reported by some of the farmers in planning and installing drainage were: (1) timeliness of installation, (2) working with neighbors and (3) working with ASCS and SCS personnel. Most farmers wanted drainage installed at the same time -- either before crops were planted or after they were harvested -- and since the number of people available for installation, including contractors, SCS technicians, etc. were few, many farmers could not get the drainage installed when they wanted it done. Working with neighbors was a particularly important problem when outlet ditches on a neighbor's property had to be used. The extent to which this was a problem depended on the personalities of the individuals involved, the cost of the project, etc. Problems in applying for cost sharing and working with the ASCS and SCS personnel included expecting the project to be cheaper than estimated, not agreeing with the recommendations of SCS technicians, and expecting too much from the cost-sharing program, e.g. hedgerow removal without agreeing to erosion control practices.

Other farmers, however, did not have these problems. Some farmers reported no difficulties in hiring contractors to do drainage work when they wanted it done. Others said that they did not mind some inconvenience (after crops were planted) in order to install the drainage when the contractor was in the area. Especially in St. Lawrence county, more farmers seemed to be installing drainage, even after crops were planted.

Farmers in St. Lawrence county in particular, reported few or no problems working with neighbors. Some had worked out informal arrangements with neighbors (involving verbal right of ways), whereas others had more formal agreements, such as, establishing a pooling agreement, where two or more farmers together applied for cost-sharing funds up to \$10,000.

The results showed that almost half of the farmers (45 percent) who would be installing surface drainage and one quarter of the farmers who would be installing tile said that it would be necessary to work with neighbors on drainage projects. Thus, it seems that the trend towards neighbors working together on projects will continue, particularly for surface drainage.

Most farmers interviewed agreed that the cost-sharing program was a strong incentive to install drainage in the North Country. The results indicated that a majority of farmers who were planning on installing drainage within the next five to 10 years would be applying for cost-sharing funds through the program. Some of the farmers who were interviewed, however, felt that dairy farmers who increased their crop acreage after installing drainage, usually expanded their dairy operations as well, which they felt was unnecessary, since the U.S. already had a surplus of many agricultural products. Farmers who had this attitude (being concerned about the larger implications of drainage) in general worked poorly drained soils and formed part of the one-third of the North Country population who were not planning to install drainage in the future.

CONCLUDING REMARKS

Most of the farmers interviewed thought that there were many advantages to having well drained land. The fact that farmers were putting in drainage

on rented land (a relatively short-term investment) and that an increasing number of farmers did not mind installing drainage after crops were planted indicated that farmers felt that soil drainage was important.

Although certain farmers may have thought that the recommendations made by SCS were too elaborate (and following them would be too costly), a majority of farmers still thought that the expense was worth having well drained land. Other farmers interviewed, however, were not convinced of the value of drainage. Many of them had been working with poorly drained soils all their lives and had adapted to working with their soils by accepting lower yields and growing predominantly hay crops.

The majority of North Country farmers, however, indicated that they would be installing drainage over the next 10 years, mostly with the assistance of the cost-sharing program. Since this study was conducted, however, the cost-sharing program has been eliminated for drainage. Whether or not these farmers will be willing to put in the drainage on their own is questionable.

Without the financial incentive, it seems that in the future, one of the strongest incentives will have to be farmers observing for themselves (as neighbors install drainage) what are the advantages of working with well drained land. According to SCS staff, this is how tile drainage is being promoted in North Country counties. As relatively large systems are being installed on farms, farmers can observe how well the systems work. In this respect, it is important for good quality tile to be used, the number of tile lines to be adequate, the system to be properly installed, etc., since any drainage installed on a farm also serves as an example for neighboring farmers. The extent to which farmers' observations of neighbors' drainage projects serves as an incentive for drainage adoption would be an interesting topic of further research.

Also in the future, the trend for farmers' to work together with neighbors, under informal arrangements, or perhaps organizing themselves into formal Drainage Districts or Associations, will be more pronounced, especially for surface drainage projects. Already there is evidence that farmers are willing to organize themselves for land drainage projects (Offenheiser, 1976; Coward and Offenheiser, 1976) and interview data from this survey support this.

Thus, with continued technical assistance from SCS, successful regional drainage projects serving as models, and the organization of farmers into formal and informal drainage projects, it is likely that installation of drainage will continue (although, at a slower rate relative to the past ten years) in the North Country. Further drainage of agricultural land will result in an increase in land productivity, e.g., higher crop yields and increased longevity and quality of legumes and grasses. It is hoped that with the continued increase in productivity of land resources, the North Country will maintain its leadership role in dairy production for New York State, the end result being increased income and standard of living for North Country communities.

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