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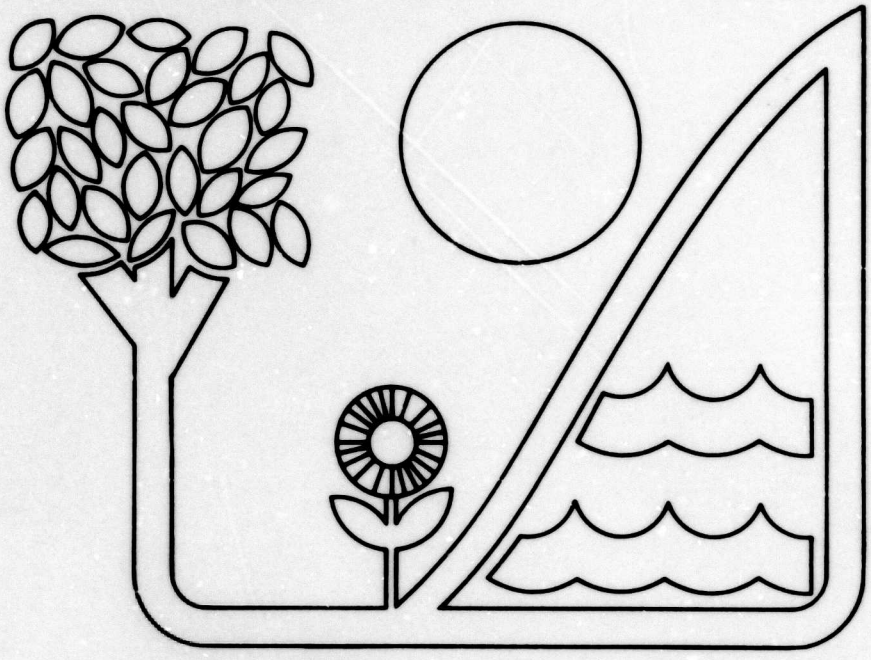

LAND DRAINAGE INVESTMENT SURVEY, 1975-77

A REPORT ON A LANDOWNERSHIP FOLLOW-ON SURVEY

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ABSTRACT

An estimated 29 million acres were affected by drainage investments in the United States during 1975-77 at a total cost of over $2.25 billion. About 415,000 ownership units drained an average of 70 acres at an average cost of about $95 per acre. Over 13.5 million acres were in the Cornbelt and Delta regions. Cropland was the dominant use of the drained land, both prior to and following drainage. Cash and savings of landowners were the source of over 80 percent of the capital necessary for drainage investments.

Key Words: Land, Drainage, Landowners, Land use, Investment, Acreage.

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A report on a Landownership Follow-on Survey

INTRODUCTION

This report is based on a portion of the Resource Economics Survey, a 1978 survey of landowners in the United States, conducted by the Natural Resource Economics Division (NRED) of the Economic Research Service, (ERS), U.S. Department of Agriculture. The Resource Economics Survey was comprised of a 12 part package to collect interrelated data on and about land resources.

The first part of the package, the Soil Conservation Service's 1977 National Resource Inventory, provided data on the use and quality of the land. The second part of the package, the 1978 Landownership Survey, provided information on land owners -- what, where, and who they are. The results of this landownership survey have been summarized by James A. Lewis. 1/

The 1978 Landownership Survey (LOS) also contained a series of questions concerning land transactions, capital expenditures, land use changes and other land management practices. These questions were used as screening questions to identify prospective respondents for a series of ten follow-on questionnaires. These ten follow-on questionnaires -- each sent to a subsample of the respondents to the LOS -- complete the 12 part Resource Economic Survey. In addition to this Land Drainage Investment follow-on survey, the others included: 1) Land Purchases and Acquisitions; 2) Land Sales and Transfers; 3) Additions to Cropland;

1/James A. Lewis, LANDOWNERSHIP IN THE UNITED STATES, 1978. Agricultural Information Bulletin No. 435. Natural Resource Economics Division; Economics, Statistics, and Cooperatives Service; U.S. Department of Agriculture, Washington, D.C., April 1980.

4) Cropland Acreage Reduction; 5) Land Clearing Investment; 6) Investment in Conservation Structures; 7) Changes in Conservation Practices (conservation disinvestment); 8) Irrigation Investment; and 9) Irrigation Disinvestment.

Screening questions on the LOS determined if a landowner had a particular activity during 1975, 1976, or 1977. By using the screening question on the main survey, the maximum amount of data was obtained with the shortest questionnaire possible and only those respondents that reported a particular activity were surveyed for that activity in the LOS follow-on surveys. The 1975-77 time period was selected as the longest time period for which accurate information could likely be obtained. More than one year was used in order to obtain more observations of a particular activity and improve the reliability of estimates of the activity.

The data presented in this report summarize responses by landowners concerning land drainage in the 48 conterminous States during 1975-77. Data include amount of land drained, type of drainage improvement, land use prior to and following drainage, participation in drainage districts, reasons for drainage, cost of drainage, and source of funds used for drainage.

THE FOLLOW-ON SURVEY

The adequacy of the Nation's supply of agricultural land to meet future demands for agricultural production is a policy issue of growing concern. In the United States, the landowner is the ultimate decision-maker regarding the land he owns. This report provides only a statistical summary of the results of the Land Drainage Investment follow-on survey. A more detailed analytical report is planned that will examine the interrelationships between characteristics of landowners and land drained during 1975-77. The report will provide information useful in determining the factors important to the change of the

supply of agricultural land. In the interim, preliminary results presented here will be useful for the continuing land policy review.

The screening question in the LOS used to identify sample points whose owners drained land during the 1975-77 period reads as follows:

13. Did you have CAPITAL EXPENDITURES during 1975-76-77 for any of the following improvements on land you own in the county? *(Please check one box for each Item).*

		YES	NO
		1	2
C. New or improved land drainage systems including outlets?	048	☐	☐

This screening question produced 4,406 positive responses from the 36,710 sample points in the conterminous United States on which owners provided data on the LOS. Of the 4,406 positive responses to the screening question, 2,200 were selected to receive the Land Drainage Investment follow-on survey. Inclusion of all 4,406 records with a positive response to the screening question in the follow-on sample would have been desirable. However, to minimize respondent burden, no sample point was included in more than 3 of 8 follow-on surveys. 2/ Sample points from the LOS that qualified for more than 3 follow-ons were randomly assigned -- with known probability -- to only 3. Points qualifying for multiple follow-ons were first assigned to those follow-ons with the smallest number of responses to their respective screening question. Data for the selected points were then expanded to represent all points qualifying for inclusion in the follow-on survey.

2/Selection of sample points for the Irrigation Investment and Irrigation Disinvestment follow-on surveys was handled separately.

A more detailed discussion of the survey method used in the multipart Resource Economic Survey is presented in Appendix 1 of Landownership in the United States. 3/ This discussion also includes a description and examples of the expansion factors used in the LOS. All data presented on land drainage have been weighted, using the expansion factors developed for the LOS. Before the expansion factors were utilized for the follow-on data, they were adjusted for: 1) the rate of subsampling from the positive responses to the LOS screening question to the final follow-on sample, and 2) the non-respondents to the final follow-on sample. Use of this weighting procedure provides estimates of U.S. totals for all data concerning land drained during the 1975-77 period.

Of the 2,200 points included in the final sample of the Land Drainage Investment follow-on survey, owners of 1,048 (48 percent) of the sample points responded with data concerning land drained during the 1975-77 period. (A copy of the follow-on survey questionnaire is included in Appendix 1 of this report.) Owners of an additional 916 (42 percent) of the sample points returned questionnaires without data while 236 (10 percent) did not respond to the follow-on survey in any manner.

The number of respondents who indicated on the follow-on that they had not drained land after indicating they had done so on the LOS screening question was quite high. One possible reason is that respondents with land in more than one county may not have realized that drainage data were to apply only to the county in which the sample point was located. Instructions on the follow-on survey were explicit regarding drainage in the same county as the sample point; thus some respondents recognized a response to the follow-on was not in order.

3/Supra note 1.

Confusion may have been created when the instructions on the Land Drainage Investment follow-on survey made an erroneous reference to the Cropland Acreage Reduction follow-on survey. Finally, some respondents may have changed their response in order to avoid the necessity of completing another questionnaire. Due to budget and time constraints there was no follow up to those responding negatively to the drainage follow-on survey after having answered positively to the screening question on the LOS.

A brief discussion of the principal survey findings is presented in the next section. The data are presented in tables following the survey findings. Some tables contain categories for "acres over reported" and "acres under reported." These categories were used in an accounting sense so that each landowner's response matches the total of all land reported to have been drained by the landowner as shown in table 1. For example, acres over reported could occur if an owner made an error in distributing his recently drained acres among alternative current uses such that the sum of the parts exceeded the total. Likewise, under reporting could occur if an owner did not account for all recently drained acres in the distribution among alternative current uses.

Coefficients of variation were computed for selected data items presented in some of the tables. Coefficients of variation (CV's) provide a means of evaluating survey results. Since CV's express variation as a fraction of the sample mean, the smaller the CV the greater the reliability of the estimate. Therefore, a statistic with a CV of 10 percent is more reliable than one with a CV of 20 percent. In interpreting CV's, if an item has a CV of 10 percent, chances are 2 out of 3 that an interval constructed to represent a range

of 90 to 110 percent of the survey value would contain the true population value. Chances are 19 out of 20, with a CV of 10 percent, that an interval constructed to represent a range of 80 to 120 percent of the survey value would contain the true population value.

SURVEY HIGHLIGHTS

Land Drained, 1975-77

Over 29 million acres were affected by drainage investments made during 1975-77 in the U.S. (table 1). The improvements made on about 18.3 million acres were solely additions to existing systems. The improvements made on 3.9 million acres were solely new drainage systems. The improvements made on the remaining 6.8 million acres had elements of both additions to existing and new drainage systems. The 95 percent confidence interval for total land affected by drainage in 1975-77 is from 22.3 million to 35.7 million acres.

There were almost 415,000 ownership units 4/ making drainage investments during the period (table 1). Over 50 percent of the ownership units made investments on projects which had elements of existing systems as well as new systems. A 95 percent confidence interval estimate for ownership units making drainage investments during 1975-77 is from 285,000 to 545,000 ownership units.

Drainage activity was most prevalent in the Cornbelt and the Delta (table 2). There was also considerable drainage in the Appalachian and Pacific regions. Relatively little drainage was installed in the Southern Plains

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4/Owners can be individuals, groups of individuals, or legal entities such as corporations, trusts or estates. Ownership unit is used in this report as a convenient term which encompases all types of legal entities having an ownership interest in land.

or the Mountains. Obviously climate, soils, and topography are important factors which greatly affect the economic feasibility of a drainage project and these factors vary widely not only between farm production regions but also within regions. However, these data on drainage activity are largely corroborated by Census of Agriculture data for 1974 which show new drainage activity was concentrated in the North Central and the Delta. 5/

Type of Drainage Improvement

Installation of tile, pipe, or subsurface drains was completed on about 14.4 million acres during 1975-77 (table 3). Over 6.2 million acres in the Cornbelt and 2.3 million acres in Appalachia were affected by installing additional subsurface drainage. The second most prevalent drainage improvement reported during the period was cleaning or dredging existing outlet ditches. Almost 4.8 million acres were affected by this practice in the Delta. The Pacific, Cornbelt, and Appalachian regions also had considerable acres affected by cleaning outlet ditches.

Surface drainage is an important method for relieving the land of excess water in many areas. Installing and repairing of field ditches is practiced extensively in the Cornbelt, Delta, and Pacific. Land shaping and grading to improve drainage is important in the Pacific, Cornbelt, Delta, and Southeast. While total land drained in the Southern Plains, Northern Plains, and Mountains is not great relative to the other farm production regions, surface drainage via field ditches and land shaping is the most common drainage investment in the three regions.

5/U.S. Department of Commerce, Bureau of the Census, 1974 Census of Agriculture, Vol. II, Statistics by Subject, Part 9, Irrigation and Drainage on Farms.

Land Use Prior to Drainage

Over 75 percent of all land drained during 1975-77 had been used as cropland (table 4). The Cornbelt and Delta exceeded 90 percent. Conversely, less than 40 percent of the land drained during the period had been used as cropland in the Southeast and Mountain regions. Pasture was an important component of land use prior to drainage in the Mountain (28 percent), Northern Plains (27 percent), and Pacific (20 percent) regions. The Mountain, Appalachian, and Southeast each had an excess of 15 percent of land in forestry use prior to drainage improvement. Almost 30 percent of all newly drained land where the prior use was forestry occurred in Appalachia. The 95 percent confidence interval estimate for acres of land used for cropland prior to drainage is from 15.6 million to 28.3 million acres.

Land Use Following Drainage

Cropland was the dominant land use following drainage investments made during 1975-77 (table 5). About 23.1 million acres were used to produce crops in 1978. The 95 percent confidence interval estimate for cropland is from 16.7 million to 29.5 million acres. The 1.1 million acre gain in cropland use following drainage is made at the expense of pasture (down .5 million) and forest/other uses (down about .9 million), adjusted for under reporting. The Delta was the only region where there were fewer acres in cropland following drainage than there was prior to drainage. The largest percentage gain in cropland use following drainage occurred in the Northern Plains, Mountain, Lake, and Southern Plains. The largest absolute increases in cropland following drainage occurred in the Appalachia, Lake, and Northern Plains regions. It is apparent that the category "Other" in table 5 contains acreage which is forest land. Forest landowners recognize drainage as a practice which yields a return by increasing growth and/or facilitating harvest.

Participation in Drainage Districts

About 15 percent of all ownership units making drainage investments during 1975-77 participated in a drainage district or other special purpose water management organization (table 6). These owners made drainage investments on about 8.8 million acres, slightly over 30 percent of the total. Over 50 percent of the ownership units participating were from the Lake or Cornbelt regions. About 34 percent of the drained land in a drainage district was in these regions. Almost 24 percent of the drained land in a drainage district was in the Delta. However, few ownership units were involved from the Delta.

In contrast, 45 percent of the ownership units holding 45 percent of the land did not participate in a drainage district. These ownership units tended to be located in the Northeast, Cornbelt, Lake, and Appalachia regions. Another 31 percent of the ownership units reported they did not know if they participated in a drainage organization.

The average acreage drained by ownership units participating in a drainage district was larger than those not participating or those who did not know whether they participated in a district, 135 acres, 70 acres, and 53 acres, respectively. The impact of governmental participation in organizing drainage districts is not clear. While relatively few ownership units participate, districts may serve as demonstrations which encourage individual investments and the local impacts may be important. It appears that the ownership units which captured benefits as a result of district participation also drained more acres per ownership unit.

Drainage Investments Related to Irrigation Systems

About 4 percent of the ownership units made joint drainage-irrigation investment decisions which affected 15 percent of the land drained during 1975-77 (table 7). Joint investments occurred with greatest frequency in the four western farm production regions. Over 50 percent of the land drained during 1975-77 in the Pacific and Southern Plains was related to an irrigation system.

Factors Important in Drainage Investment Decision

The factor listed most often as important in the decision to make drainage investments among ownership units who drained land in 1975-77 was to improve farm efficiency (table 8). Almost 75 percent of the owners listed efficiency as a reason; these units drained 85 percent of the land drained for the period. Improved efficiency was listed most often as a factor important in the drainage decision in every farm production region.

Over 25 percent of the ownership units listed increased availability of capital and 15 percent cited the development of new farm land as important factors in the drainage decision. The ownership units listing these reasons as important drained 3.9 million and 6.7 million acres, respectively. Almost 14 percent of the ownership units did not respond to the question.

Several factors were specific to farm production regions, e.g., those who listed irrigation waters available through a government project were almost exclusively in the Pacific; salinity control was listed most often by those in the Southern Plains and Pacific; and main outlet provided by a government project was most prevalent in the Cornbelt and Delta.

Cost of Drainage

Landowners invested about two and one quarter billion dollars to drain about 24 million acres during 1975-77 (table 9). The average expenditure was $94 per acre and $6,980 per ownership unit. Over 19.7 million acres were drained for less than $100 per acre. About 174,000 acres were drained during 1975-77 at an average cost of $4,400 per acre. Some factors which contribute to the cost of drainage, and therefore the variation of cost, are soil type, topography, vegetation, type of drainage, and outlet. In addition to these direct physical/engineering costs, owners often face costs associated with laws and rules regulating drainage which have arisen because additional water may detract from the property rights of downstream property owners and users.

Over 53 percent of the drainage investment occurred in two regions, the Northeast and Appalachia (table 10). The proportion of total dollars invested in these two regions greatly exceeded their proportion of total acres drained. Thus the average cost of drainage was about $960 and $160 per acre for the Northeast and Appalachia, respectively, while the balance of the country averaged about $50 per acre. Respondents from the Delta reported spending about $10 per acre on drainage projects, less than any other regions.

Type of drainage improvements also affects the cost (table 11). Installing or repairing tile costs about $105 per acre while surface water collection via field ditching costs less than $25 per acre. As expected, applying several practices to the same acres increases the cost. Miscellaneous combinations of types of drainage improvements averages almost $150 per acre. These cost data do not allow an accurate division of funds spent for capital improvements and funds spent for maintenance of capital improvements.

Federal Engineering or Planning Assistance

In addition to direct cost sharing (discussed in the next section) landowners can receive grants in the form of technical assistance for designing and building their drainage system. Technicians from the Soil Conservation Service are stationed in local district offices throughout the country and provide this and other services. About 29 percent of the landowners who drained land during 1975-77 received federal engineering or planning assistance (table 12). These owners drained about 39 percent of the land for the period.

Almost 59 percent of the owners, who drained slightly less than 57 percent of the land drained, did not receive any federal planning assistance. Reasons for not receiving planning assistance are not known, but it is likely some owners were simply not aware technical help was available. Soil Conservation Service personnel are prohibited from providing technical assistance in certain cases, e.g. drainage of wetlands pursuant to SCS Conservation Planning Memorandum 15 of 1975.

Source of Funds

Personal funds (cash or savings) were the most widely used source of funds for drainage improvements on the basis of three comparisons, ownership units, acres and total dollars (table 13). Federal cost sharing was the next most widely used source of funds, except when considered as the proportion of total dollars. That is not inconsistent since Federal programs often are designed to distribute dollars among as many participants as possible. In addition, limits on individual subsidies tend to distribute the dollars among more owners. Loans, especially from the Federal Land Bank and other banks and savings and loan institutions, are an important part of the funding of drainage improvement projects.

Table 1--Distribution of ownership units and acres by new or improved drainage systems installed during 1975-77, U.S.

Drainage system	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Additions to existing drainage systems only	214.1	51.6	18,340.1	63.2
New drainage systems only	76.4	18.4	3,885.8	13.4
Improvements to existing systems and new drainage systems installed	124.4	30.0	6,781.5	23.4
Total	414.9 1/ (15.7)	100.0	29,007.4 (11.5)	100.0
Total additions to existing drainage system	338.5	81.6	22,532.8	77.7
Total new drainage systems	200.8	48.4	6,474.6	22.3
Total	2/ 414.9 (15.7)	100.0	29,007.4 (11.5)	100.0

1/Numbers in parentheses are coefficients of variation for the estimate immediately above.

2/Ownership units do not sum to the total since 124,400 units made both types of drainage investments.

Source: 1978 Resource Economics Survey.

Table 2--Distribution of acres by new or improved drainage systems installed during 1975-77 by farm production region.

Region	Additions to existing drainage systems	New drainage systems	Improvements to existing systems and new drainage systems installed	Total
		-Thousand acres-		
Northeast	854.9	267.8	370.6	1,493.3 1/ (28.7)
Lake	1,147.4	315.0	441.6	1,904.0 (15.2)
Cornbelt	5,584.1	919.0	1,484.5	7,987.6 (10.3)
Northern Plains	754.2	177.3	655.6	1,587.1 (28.5)
Appalachian	2,774.3	292.9	724.2	3,791.4 (40.3)
Southeast	792.3	347.1	672.0	1,811.4 (18.1)
Delta	4,268.7	116.9	1,216.2	5,601.8 (40.8)
Southern Plains	267.4	59.3	462.2	788.9 (34.9)
Mountain	458.9	147.4	381.7	988.0 (26.1)
Pacific	1,437.9	1,243.1	372.9	3,053.9 (29.4)
U.S.	18,340.1	3,885.8	6,781.5	29,007.4 (11.5)

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economic Survey.

Table 3--Distribution of ownership units and acres by type of drainage improvement installed during 1975-77, U.S.

Type of drainage improvement	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Install additional tile, pipe or subsurface drains	216.7	52.2	14,369.7	49.5
Repair existing subsurface drainage system	60.5	14.6	4,015.7	13.8
New outlet ditches	111.1	26.8	3,167.7	10.9
Clean existing outlet ditches	171.8	41.4	11,498.0	39.6
Install/repair field ditches	124.7	30.1	10,692.3	36.9
Install outlet pumping plant	39.0	9.4	2,635.8	9.1
Land shaping to improve drainage	175.6	42.3	9,633.6	33.2
Other	9.2	2.2	1,012.7	3.5
No response	1.0	.3	199.8	.7
Total	1/ 414.9	100.0	1/ 29,007.4	100.0
	2/ (15.7)		(11.5)	

1/Owners may respond to more than one improvement for each acre; thus the individual improvements do not sum to the total.

2/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 4--Distribution of ownership units and acres by land use prior to drainage on systems installed during 1975-77, U.S.

Land use	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Cropland	223.1	53.8	21,956.9	75.7
	1/ (14.2)		(14.5)	
Pasture	117.8	28.4	2,828.2	9.7
	(37.5)		(17.3)	
Forest	110.2	26.6	2,000.4	6.9
	(43.7)		(23.4)	
Idle	1.7	.4	45.0	.2
	(39.7)		(41.8)	
Other	15.8	3.8	1,386.9	4.8
	(46.1)		(36.3)	
No response	49.9	12.0	318.7	1.1
	(70.3)		(26.0)	
Under reported	10.4	2.5	471.3	1.6
Over reported	--	--	--	--
Total	2/ 414.9	100.0	29,007.4	100.0
	(15.7)		(11.5)	

-- = None reported.

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

2/Owners may respond to more than one use category; thus the individual uses do not sum to the total number of owners.

Source: 1978 Resource Economics Survey.

Table 5--Distribution of ownership units and acres by land use following drainage on systems installed during 1975-77, U.S.

Land use	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Cropland	238.2	57.4	23,100.6	79.7
	1/ (13.5)		(13.8)	
Pasture	109.4	26.4	2,255.9	7.8
	(40.2)		(20.6)	
Other	53.0	12.8	2,444.2	8.4
	(29.0)		(19.7)	
No response	46.8	11.3	432.8	1.5
	(74.7)		(44.8)	
Under reported	12.2	2.9	767.8	2.6
Over reported	.3	-.1	-3.9	*
Total	2/ 414.9	100.0	29,007.4	100.0
	(15.7)		(11.5)	

* = Less than .05 percent.

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

2/Owners may respond to more than one use category; thus the individual uses do not sum to the total number of owners.

Source: 1978 Resource Economics Survey.

Table 6--Distribution of ownership units and acres by participation in a drainage district on land drained during 1975-77, U.S.

Participation and organizer of drainage district	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Participation in a district by organizer of the district:				
Local government	31.1		3,613.4	
State government	4.0		364.9	
Federal government	10.5		2,105.4	
Private individuals	15.3		2,133.8	
Don't know	4.1		572.1	
Total participation in a district	65.0 (13.5) 1/	15.7	8,789.6 (14.2)	30.3
Do not participate in a district	186.4 (15.2)	44.9	13,039.3 (17.7)	45.0
Do not know if participate in a district	129.9 (39.2)	31.3	6,911.0 (34.2)	23.8
No response	33.6 (95.7)	8.1	267.5 (52.5)	.9
Total	414.9 (15.7)	100.0	29,007.4 (11.5)	100.0

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 7--Distribution of ownership units and acres by irrigation investments on land drained during 1975-77, U.S.

Irrigation investment	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Made irrigation investment	15.8	3.8	4,392.7	15.1
Did not make irrigation investment	361.0	87.0	23,548.5	81.2
No response	38.1	9.2	1,066.2	3.7
Total	414.9 1/ (15.7)	100.0	29,007.4 (11.5)	100.0

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 8--Distribution of ownership units and acres by factors important in the decision to drain land during 1975-77, U.S.

Factors	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Outlet provided by a government project	13.5	3.2	1,225.8	4.2
Irrigation water provided by a government project	1.2	.3	1,094.4	3.8
Improve farm efficiency	304.1	73.3	24,751.6	85.3
Salinity control	6.9	1.7	2,671.9	9.2
Develop new farm land	64.4	15.5	6,727.4	23.2
Increased availability of capital	109.1	26.3	3,886.0	13.4
Change in crop prices	15.5	3.7	1,671.5	5.8
Other	33.0	8.0	1,380.6	4.8
No response	57.4	13.8	1,194.1	4.1
Total	1/ 414.9 2/ (15.7)	100.0	1/ 29,007.4 (11.5)	100.0

1/Owners may respond to more than one factor; thus the individual factors do not sum to the total.

2/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 9--Distribution of ownership units, acres, and total cost by cost of draining on land drained during 1975-77, U.S.

Cost per acre	Ownership units		Acres		Cost	
	Thous.	Pct.	Thous.	Pct.	Million dollars	Pct.
Less than $50	86.5	20.9	17,438.0	60.1	203.7	9.0
$50-$99	70.7	17.0	2,265.7	7.8	168.1	7.5
$100-$249	46.1	11.1	1,657.7	5.7	270.5	12.0
$250-$499	38.0	9.2	2,258.1	7.8	740.1	32.9
$500-$749	10.8	2.6	75.5	.3	50.8	2.3
$750-$999	2.1	.5	50.7	.2	45.4	2.0
$1000 and over	67.7	16.3	173.8	.6	771.0	34.3
No response	93.0	22.4	5,087.9	17.5	--	--
Total	414.9 1/ (15.7)	100.0	29,007.4 (11.5)	100.0	2,249.6	100.0

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 10--Distribution of total investment and corresponding acres drained during 1975-77 by farm production region.

Region	Investment		Acres	
	Million dollars	Pct.	Thous.	Pct.
Northeast	670.8	29.8	696.9	2.9
Lake	124.8	5.5	1,429.6	6.0
Cornbelt	338.1	15.0	6,994.4	29.2
Northern Plains	52.1	2.3	1,182.6	5.0
Appalachian	534.4	23.8	3,351.6	14.0
Southeast	139.2	6.2	1,397.3	5.8
Delta	55.5	2.5	5,137.8	21.5
Southern Plains	32.9	1.5	691.3	2.9
Mountain	18.3	.8	738.1	3.1
Pacific	283.5	12.6	2,300.3	9.6
U.S.	2,249.6	100.0	23,919.7	100.0
No response			5,087.7	--
Total			29,007.4 1/ (11.5)	

1/Number in parenthesis is coefficient of variation for the estimate immediately above.

Source: 1978 Resource Economic Survey.

Table 11--Distribution of ownership units, acres, and cost by type of drainage improvement installed during 1975-77, U.S.

Type of drainage improvement	Ownership units		Acres		Cost		Acres with no response to cost
	Thous.	Pct.	Thous.	Pct.	Million	Pct.	Thous.
Install/repair tile	85.2	20.5	7,651.9	26.4	715.0	31.8	903.3
Install/clean outlet	31.3	7.5	4,939.6	17.0	64.0	2.8	509.6
Tile and outlet	30.1	7.2	1,564.6	5.4	121.4	5.4	102.5
Field ditch	15.5	3.7	862.0	3.0	12.8	.6	318.8
Field ditch and outlet	26.8	6.5	1,964.9	6.8	11.7	.5	850.4
Pumping plant	32.1	7.7	57.7	.2	.6	*	31.9
Grading	18.9	4.6	935.7	3.2	68.5	3.0	231.0
Grading and outlet	11.5	2.8	571.4	2.0	33.2	1.5	53.8
Other	3.2	.8	300.1	1.0	23.6	1.1	100.2
Miscellaneous combinations	159.3	38.4	9,959.7	34.3	1,196.4	53.2	1,873.1
No response	1.0	.3	199.8	.7	2.4	.1	113.1
Total	414.9 1/(15.7)	100.0	29,007.4 (11.5)	100.0	2,249.6	100.0	5,087.7

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 12--Distribution of ownership units and acres by federal planning assistance on land drained during 1975-77, U.S.

Planning assistance	Ownership units		Acres	
	Thous.	Pct.	Thous.	Pct.
Received federal planning assistance	120.1	28.9	11,066.3	38.1
Did not receive federal planning assistance	243.0	58.6	16,434.0	56.7
No response	51.8	12.5	1,507.1	5.2
Total	414.9	100.0	29,007.4	100.0
	1/(15.7)		(11.5)	

1/Numbers in parentheses are coefficients of variation for the estimates immediately above.

Source: 1978 Resource Economics Survey.

Table 13--Distribution of ownership units, acres, and dollars by source of funds for drainage improvements made during 1975-77, U.S.

Source of funds	Ownership units		Acres		Dollars	
	Thous.	Pct.	Thous.	Pct.	Million	Pct.
Federal share (ASCS-ACP or REAP)	89.0	21.4	2,456.3	8.5	85.9	3.8
Personal funds	343.3	82.8	21,308.4	73.5	1,826.5	81.2
Loans from:						
Individual	11.4	2.7	403.1	1.4	41.3	1.8
FmHA	1.2	.3	70.9	.2	2.7	.1
PCA	5.6	1.3	323.4	1.1	19.4	.9
FLB	16.9	4.1	390.4	1.3	123.9	5.5
Banks/Savings and Loan	11.1	2.7	1,587.0	5.5	92.2	4.1
Insurance Co.	.2	.1	198.2	.7	1.3	.1
Other sources	3.8	.9	416.7	1.4	36.9	1.6
No response	43.0	10.4	1,528.7	5.3	19.5	.9
Under reported	4.2	1.0	324.3	1.1	--	--
Over reported	--	--	--	--	--	--
Total	1/ 414.9 2/ (15.7)	100.0	29,007.4 (11.5)	100.0	2,249.6	100.0

-- = None reported.

1/Owners may respond to more than one funding source; thus the individual sources do not add to the total.

2/Numbers in parentheses are coefficients of variation for the estimate immediately above.

Source: 1978 Resource Economics Survey.

APPENDIX 1

Crop Reporting Board

Economics, Statistics, & Cooperatives Service

U.S. Department of Agriculture

Washington, D.C. 20250

Form Approved
O.M.B. Number 40-S-77043
Approval Expires 9-30-79

001

DRAINAGE INVESTMENT SURVEY

List Code 948

Dear Land Owner:

Your assistance is needed to provide information about cropland acreage reduction during 1975, 1976, or 1977 on land you had *either a full or part ownership interest in* on January 1, 1978 in the COUNTY SHOWN IN THE ADDRESS LABEL.

The information you provide will remain confidential and will be used only in combination with other reports to develop summaries about cropland acreage reduction throughout the United States. Your response to this questionnaire is completely voluntary and not required by law.

Your returning the completed questionnaire by mail will be greatly appreciated and will help hold down survey cost. Additional contacts will be made with those not returning the questionnaire by mail to the extent possible to insure a representative sample is obtained.

Respectfully,

Bruce M. Graham

BRUCE M. GRAHAM, Chairman
Crop Reporting Board

1. **Which of the following types of drainage improvement did you invest in during 1975, 1976 and 1977 on the land you owned January 1, 1978 in the county listed in the address label?** *(Please check more than one if needed)*

A. Install additional tile, pipe or subsurface drains	087
B. Repair existing subsurface drainage system	088
C. Dig new outlet ditches	089
D. Clean or dredge existing outlet ditches	090
E. Install or repair field ditches	091
F. Install outlet pumping plant	092
G. Land shaping, smoothing, or grading to improve drainage	093
H. Other *(Specify* _____ 096)	094

NOTE: If there have not been any investments for drainage listed in Item 1 for your land in this county, please sign the last page and return the questionnaire in the enclosed envelope.

2. **How many acres are served by the above drainage imporvements which you have made during 1975, 1976 and 1977 on land you owned January 1, 1978 in the county listed in the address label?**

A. Improvements or additions to existing drainage system(s) ..... ACRES	110
B. New drainage system(s) ..... ACRES	111

NOTE: The remaining questions refer to the drainage improvements checked in Item 1 and the acreage reported in Item 2A and 2B.

3. **How many acres reported in 2A and 2B above were in the following uses** *prior to drainage improvement?*

A. Cropland, including hayland ..... ACRES	113
B. Pasture, grass or rangeland ..... ACRES	114
C. Forest ..... ACRES	115
D. Other *(Specify* _____ 136) ..... ACRES	116

4. **How many of these acres were in the following uses during 1978?**

A. Cropland, including hayland ..... ACRES	117
B. Pasture, grass or rangeland ..... ACRES	118
C. Other *(Specify* _____) ..... ACRES	119

5. Is the drained land included in an established drainage district or other special purpose water management organization? *(Please check)*

[1] YES - *Continue.*

Office Use [062]

[2] NO

[3] DON'T KNOW } *Skip to Item 6.*

A. If YES, check which of the following established it? *(Please check)*

1. Local government ..... [161]
2. State government ..... [162]
3. Federal government ..... [163]
4. Private individuals or groups ..... [164]
5. Don't know ..... [165]

B. If your land is in an established drainage district or other special purpose water management organization, has this organization improved or cleared outlets serving your land during 1975, 1976 or 1977?

[1] YES - *Continue.* [2] NO - *Skip to Item 6.* Office Use [034]

1. If YES, what was the total amount you were assessed during 1977? ..... Dollars [035]

6. Was your investment in drainage systems related to an irrigation system? *(Please check)*

[1] YES [2] NO Office Use [023]

7. Please check all of the following factors that were important in your decision to improve the drainage for agricultural use.

A. Main outlet was provided by a government project. ..... [166]
B. Irrigation water was made available by a government project. ..... [167]
C. Enables more efficient farm operations ..... [168]
D. Salinity control ..... [169]
E. Develope new farm land. ..... [170]
F. Increased availability of operating or investment capital ..... [171]
G. Change in crop prices ..... [172]
H. Other *(Specify* _____) [174] ..... [173]

8. What was the total cost of construction and improvements?
(Include custom and contract work plus all other labor and material cost). . Total Dollars [070]

9. Did you receive engineering or planning assistance from a Federal agency for the drainage work described in Item 1? *(Please check)*

[1] YES [2] NO Office Use [024]

10. What percent of the drainage improvement cost came from the following sources:

	PERCENT
A. Federal government share *(ASCS — ACP or REAP)*	072
B. Personal Funds *(cash on hand or savings)*	073
C. Loan(s) from:	
1. Individual	074
2. Farmers Home Administration *(FmHA)*	075
3. Production Credit Association *(PCA)*	076
4. Federal Land Bank	077
5. Other bank or savings and loan association	078
6. Insurance Company	079
7. Small Business Association *(SBA)*	080
D. Other *(Specify* _____)	081
TOTAL	100%

Reported by _____ Date _____

Phone Number (_____) _____
Area Code

The enclosed envelope does not require a stamp.

APPENDIX 2

TEN FARM PRODUCTION REGIONS

Northeast

Connecticut
Delaware
Maine
Maryland
Massachusetts
New Hampshire
New Jersey
New York
Pennsylvania
Rhode Island
Vermont

Lake

Michigan
Minnesota
Wisconsin

Corn Belt

Illinois
Indiana
Iowa
Missouri
Ohio

Northern Plains

Kansas
Nebraska
North Dakota
South Dakota

Appalachian

Kentucky
North Carolina
Tennessee
Virginia
West Virginia

Southeast

Alabama
Florida
Georgia
South Carolina

Delta

Arkansas
Louisiana
Mississippi

Southern Plains

Oklahoma
Texas

Mountain

Arizona
Colorado
Idaho
Montana
Nevada
New Mexico
Utah
Wyoming

Pacific

California
Oregon
Washington