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A RESUME OF SOME FARM INCOME STUDIES

THE relationship between farm income and mortgage experience was not covered directly in the experience studies just reviewed, largely because satisfactory income data were not available. In business lending, the borrower usually submits an income statement covering his operations over the preceding several years, but in farm lending the practice is not common. Often the borrower is buying the farm on which he applies for a loan; hence he has no statement. Even if an applicant has been farming his own land for some time, he may not have kept adequate financial records. Furthermore, many lenders are of the opinion that actual income statements are not particularly helpful in making long-term mortgage loans, since the original mortgagor may die or sell his farm to someone else who assumes the mortgage and who may be either more or less efficient than the first. For those reasons information concerning actual incomes on farms on which mortgage loans have been made is seldom available.

As a result of the farm mortgage distress that followed World War I, however, lenders began to place emphasis on potential earning power as a source of financial security and to rely somewhat less on the sale value of collateral assets. But instead of seeking conventional statements of past income, most institutional lenders preferred to make estimates of probable future farm income under so-called typical operation. Such estimates, which are ordinarily made at the time farms are appraised for loans, may serve either as aids in valuation or to ascertain whether earnings are likely to be sufficient to cover interest and amortization.

It was not until the late twenties that many institutional lenders began making estimates of typical earning power on a careful, systematic basis. Consequently the information was not particularly helpful to students of mortgage experience analyzing loans made in earlier periods. Most of the studies reviewed in Chapter 6 included loans made before 1920, and one of them, the Montana study, went back as far as 1911.

Although it has been impossible for the most part to compare directly the mortgage experience of individual farms during the

interwar period either with actual income records or with estimates of typical earning power, the experience studies reviewed in Chapter 6 brought out many relationships between mortgage experience and factors that imply differences in farm income. In the earlier studies, differences in income were implied by such criteria as appraised values per acre and differences in soils. In the later studies income differences were even more clearly implied in the analyses of loan experience by land class, net income area, or other categories in which land is classified according to its physical productivity and its ability to produce a financial return.

This chapter will review three studies that have dealt directly with variations in farm income from one grade of land to another and have related it to debt carrying capacity, though not paying much attention to foreclosure experience: the first, concentrating on farms in Frederick county, Maryland; the second, on the Newfane fruit section south of Lake Ontario in Niagara county, New York; and the third, on wheat yields and land values in northern Idaho. A fourth study, by the Bureau of Agricultural Economics, is concerned with variations among types of farming rather than grades of land, and is of interest because its coverage of certain of the farm types in many different areas gives it a possible bearing on the economic geography of farm mortgage distress.

Frederick County, Maryland

O. H. White analyzed the records of 205 Frederick county farms for 1938 and made estimates of average net cash income for farms in land classes II, III, IV, and V.[1] He then adjusted the income averages for family living expenses to obtain estimates of the amount of income, by land class, available for mortgage payments. Finally, he was able to estimate the maximum long-term loans that could be carried with the average available

[1] O. H. White, *The Productivity of Land in Relation to Farming Returns, Farm Capital, and Loan-Paying Capacity, Frederick County, Maryland, 1938* (Farm Credit Administration, mimeo., March 1941).

Land where some farming is being done but on which most of the farms are poor comprises land class II. If accessible and well located with respect to nonfarm job opportunities, it may be used for rural residential purposes. Otherwise it is better suited to forest and recreational uses than to permanent agriculture.

Land classes III, IV, and V comprise areas that probably will remain permanently in agriculture. The highest number indicates the best opportunity for farmers to earn incomes.

income for each land class, and to compare the hypothetical maximum loans with amounts that might have been granted under the then existing federal land bank standards. The highlights of White's findings are summarized in Table 22.

TABLE 22

Profitability and Debt Carrying Capacity of 205 Farms in Frederick County, Maryland, in 1938, by Land Class

	Land Class			
	II	III	IV	V
Average net cash income[a]	$217	$779	$1,585	$3,450
Cash living costs	413	694	973	1,398
Net cash income above living costs	—196	85	612	2,052
Implied maximum loan at 4 percent interest and amortization in 34½ years	0	1,574	11,333	38,000
Average value of farm real estate[b]	*2,629*	*7,467*	*12,192*	*20,724*
Land	1,336	3,822	5,853	9,716
Buildings	1,293	3,645	6,339	11,008
Maximum federal land bank loan[c]	927	2,640	4,194	7,060
Annual payment at 4 percent interest and amortization in 34½ years	50	142	226	381
Rate of return: net cash income to total capital	6%	8%	10%	13%

From *The Productivity of Land in Relation to Farming Returns, Farm Capital, and Loan-Paying Capacity, Frederick County, Maryland, 1938*, by O. H. White (Farm Credit Administration, mimeo., March 1941), Tables 9, 39, and 40, pages 13 and 42 f.

[a] Total cash receipts less cash expenditures. See Table B-1, page 223.

[b] Farmers' estimates.

[c] The maximum loan is computed as 50 percent of the average land value plus 20 percent of the average value of farm buildings, without regard to the legal limitations on loan units of less than $100.

In land class II, the poorest represented in the study, the 36 sampled farms had an average net cash income of $217 in 1938, which was inadequate to cover estimated living expenses of $413. Hence there would be no income available to meet mortgage payments in land class II—at least not from farm operations. In contrast, the 34 farms in land class V had an average net cash income of $3,450, which was sufficient to cover estimated living costs of $1,398 and leave a comfortable margin of

$2,052. What maximum loan could have been carried on that margin? In the 1930's the maximum contract length for amortized land bank loans was 34½ years, and the lowest rate of interest was 4 percent. A loan with such terms could be retired in equal annual payments of $54 per $1,000 of principal. At that rate, the $2,052 margin would have supported a principal amount of $38,000.[2]

A comparison of estimated debt carrying capacity with maximum allowable land bank loans was undertaken. At the time of White's study, land bank loans were limited to 50 percent of the appraised value of the farm land plus 20 percent of the value of the buildings. Separate valuations for land and buildings of the Frederick county farms were therefore needed, and were obtained through farmers' estimates. In land class v, farmers valued their land at $9,716, on the average, and the buildings at $11,008 (Table 22). Those amounts would have justified a land bank loan of $7,060 at the most, which is less than 20 percent of the maximum loan of $38,000 indicated by the income analysis. A somewhat similar situation existed in land class IV; the maximum loan by land bank standards was less than 40 percent of the maximum loan on an income basis. In land classes II and III, however, the maximum allowable land bank loan was substantially larger than the maximum loan as judged by income from farming. Thus, in terms of earning power and capacity to pay, the land bank lending standards appear to have been overgenerous in the lower land classes and conservative in the better land classes.

An important consideration, however, tends to mitigate the implied overlending of the land bank in the lower land classes. Loans in these land classes, and the interest and amortization payments on them, would be small. The $927 estimated maximum land bank loan for land class II, for example, could be retired at the rate of $50 a year (for a 34½ year loan at 4 percent interest)—an amount that could be covered fairly easily through off-farm work.

One other comparison is noteworthy, namely the variation in rates of return among land classes. Net cash income when expressed as a percent of total farm capital varied from 6 percent in land class II to 13 percent in land class V (Table 22). The variation is even more spectacular when net cash income is adjusted for the value of operator and family labor—a very

[2] Further reference to White's estimates of debt carrying capacity is made in the section on earnings coverage, page 172.

common adjustment for calculating rates of return in farming. In land class II the labor charge was valued at more than the net cash income; hence the rate of return for the lowest land class was negative, —1.7 percent.[3] In land class V the rate of return was 11.4 percent, even after the adjustment for labor.

Soils and Incomes in the Newfane Area

Since 1913 the Department of Agricultural Economics at Cornell University has been obtaining business records for a number of farms in Newfane township, Niagara county, New York.[4] Although the attempt was made to cover identical farms from year to year, some variation was inevitable, partly because farms may be broken up or combined, partly because individual farm owners may cooperate in providing information in some years but not in others.

The Newfane area is located in the western New York fruit belt, which extends along the south shore of Lake Ontario. Apples and peaches are the two chief crops, along with a wide variety of other products such as cherries, plums, cabbages, tomatoes, wheat, and beans. Climatic conditions in Newfane are moderated by the proximity of Lake Ontario and are well suited to orchards. Soil conditions are quite variable; the better soils are well suited to fruit, but the poorer soils are not.

A considerable amount of farm financial distress in Newfane has arisen from the variability of its soils, often not readily apparent. Good orchard land requires a deep topsoil and a porous subsoil to provide good drainage. Neither condition is evident from superficial inspection, but must be established by boring into the soil, perhaps to a depth of six feet. Before the importance of subsoil analysis was fully understood, many Newfane orchards were planted on land with inadequate drainage. This, of course, was a serious mistake, for the planting of an orchard involves a heavy capital outlay that must be amortized over a long period. Moreover, some time elapsed before such mistakes were recognized, because the full effects of poor drainage

[3] White, *op.cit.*, Table 25, p. 24.

[4] Collection of data in the Newfane area has been under the direction of Professor G. P. Scoville. In making our analysis we have had recourse to two papers by Herrell F. DeGraff: *An Economic Study of Farming in the Town of Newfane, Niagara County, New York* (unpublished Ph.D. thesis, Cornell University, 1941), and *The Ownership and Mortgage History of Farms in the Town of Newfane, Niagara County, New York* (New York State College of Agriculture, Cornell University, No. A.E. 341, mimeo., March 1941).

develop only in older orchards. After about twenty years, yields decline and trees begin to die.

The gradual adjustment of Newfane agriculture to soil variations had a pronounced effect on land use in the area. Farmers on the better grade of land found that they were able to specialize in intensive fruit culture, with emphasis on a quality product. Those on poorer land, however, were forced into more diversified and more extensive agriculture. Some of the statistical highlights of this shift are contained in Table 23,

TABLE 23

Variations in Intensiveness of Farming in Newfane, New York, 1913-39, by Soil Group

	Soil Group[a]						
	1	2	3	4	5	6	Average
1913-19							
Share of all receipts due to fruit	84%	75%	73%	54%	50%	44%	64%
Total receipts per acre[b]	$61	$62	$52	$40	$38	$36	$46
Total expenditures per acre[c]	40	37	31	24	22	22	28
Farm income per acre	21	25	21	16	16	14	18
1920-29							
Share of all receipts due to fruit	79%	71%	69%	53%	51%	45%	62%
Total receipts per acre[b]	$91	$71	$61	$49	$41	$38	$54
Total expenditures per acre[c]	68	48	43	34	31	27	39
Farm income per acre	23	23	18	15	10	11	15
1930-39							
Share of all receipts due to fruit	85%	65%	62%	45%	38%	32%	60%
Total receipts per acre[b]	$84	$58	$42	$30	$29	$24	$42
Total expenditures per acre[c]	61	42	32	24	24	20	32
Farm income per acre	23	16	10	6	5	4	10

From Herrell F. DeGraff's *An Economic Study of Farming in the Town of Newfane, Niagara County, New York* (Cornell University, unpublished Ph.D. thesis, 1941), Tables 23 and 26, pages 68 and 72. The data cover 354 farms.

[a] Farms grouped by adaptability of soil to fruit growing, from best (group 1) to poorest (group 6); see text footnote 5.

[b] Includes increases in the value of inventory as well as purely cash receipts.

[c] Includes unpaid family labor and decreases in the value of inventory as well as cash expenditures. See Tables B-1 and B-2, Appendix B.

which covers six soil groups (that is, groups of farms classified according to the suitability of their soils for fruit growing) and three periods, 1913-19, 1920-29, and 1930-39. The soil groups are arranged in order from farms on land best adapted to fruit, group 1, to those on land least adapted, group 6.[5]

[5] The following quotation from DeGraff's thesis, *An Economic Study of Farming in . . . Newfane*, page 58, explains the method of classification:

"With the assistance of Mr. C. S. Pearson of the Department of Agronomy at the New York State College of Agriculture, the important soils of the Newfane area have been separated into three groups on the basis of depth and rapidity of internal drainage, as follows:

Adaptability of Soils of the Newfane-Olcott Area for Fruit Growing

Soils well adapted to fruit	*Soils less well adapted to fruit*	*Soils poorly adapted to fruit*
Alton gr. f.s. lm.	Barker gr. lm.	Allendale f.s. lm.
Alton f.s. lm.	Barker f.s. lm.	Barker gr. lm. imperfectly drained phase
Alton gr. lm.	Barker gr. f.s. lm.	Colwood si. lm.
Alton coarse s. lm.	Berrien f.s. lm.	Eel si. lm.
Appleton f.s. lm.	Berrien lm. f.s.	Farmington si. lm.
Arkport f.s. lm.	Clarkson gr. lm.	Fulton si. cl. lm.
Dunkirk lm.	Clarkson gr. s. lm.	Granby f.s. lm.
Dunkirk f.s. lm.	Collamer si. lm.	Hilton gr. lm.
Dunkirk si. lm.	Collamer si. cl. lm.	Hilton gr. lm., heavy subsoil phase
Dunkirk si. cl. lm.	Hamlin si. lm.	Hilton gr. f.s. lm.
	Lockport si. cl. lm., well drained phase	Hilton gr. si. lm.
	Ontario si. lm.	Hilton gr. si. lm., heavy subsoil phase
		Hilton si. lm.
		Hilton si. lm., heavy subsoil phase
		Lockport si. cl. lm.
Legend:		Lockport si. cl. lm., imperfectly drained
Alton gr. f.s. lm. = Alton gravelly fine sandy loam		Maumee lm. f.s. phase
Dunkirk si. cl. lm. = Dunkirk silty clay loam		Toledo si. cl. lm.
Berrien lm. f.s., etc. = Berrien loamy fine sand		Wauseon f.s. lm.
		Wayland si. lm.
		Wolcottsburg si. lm.

"The soils listed as being well adapted to fruit are the deepest and best drained. Those given as poorly adapted are either shallow or imperfectly drained or both. The others are intermediate. Within the groups there are, of course, some differences, but they are thought to be less than the differences between the groups.

"For each of the Newfane farms on which records have been obtained, the acreage of each important soil type on the farm was determined. This was done by using a map bearing both soil lines and farm lines and planimetering the area of each soil within the farm boundaries. (This work was done by the Farm Credit Administration under the direction of Dr. A. B. Lewis . . . in connection with a study of the relation of income to capital.) Using these data the per cent of good, medium and poor fruit soils as classified above was de-

Even in the early period, 1913-19, farmers in the better soil groups derived a much higher share of their total receipts from fruit than farmers in the poorer groups. The group 1 farmers, for example, derived 84 percent of their receipts from fruit; the group 6 farmers derived only 44 percent. In the latest period, 1930-39, the differences between soil groups had become considerably more pronounced. The share derived from fruit receipts had increased ever so slightly from 84 percent to 85 percent for group 1; it had decreased for all other groups.

In 1913-19 there was some variation in total receipts per acre, ranging from $62 (for group 2) to $36 (for group 6). The range of variation increased in the later periods. By 1930-39 receipts per acre had increased substantially for group 1, from $61 to $84, whereas decreases had occurred for all other groups. Expenses per acre had also increased substantially for group 1, but less than receipts. In the other groups, expenses had changed hardly at all—sometimes increasing by a few dollars, sometimes decreasing. A detailed analysis of expenditures reveals that the increase for group 1 was due mainly to greater use of spray and higher outlays for packaging, changes made for the purpose of producing and marketing a high grade, specialty product.[6]

The net effect of these changes in receipts and expenditures on farm income was substantial. In 1913-19 the variations in farm income per acre were not marked, ranging only from $25 to $14, group 2 having the highest. By 1930-39, however, farm income per acre had increased slightly for group 1 and had decreased for all others. The range then extended from $23 for the best soil group to $4 for the poorest. Average farm income per farm and average rate of return, derived by expressing farm income as a percentage of total farm capital, are shown in

termined for each farm. The farms were then divided into six groups for analysis on the basis of the percentage of good, medium, and poor fruit soil on the individual farms. Those placed in soil group 1 were considered to be best suited to fruit. They averaged nearly 80 per cent good fruit soil and less than 10 per cent poor. Group 6 includes the farms least adapted to fruit. They averaged over 90 per cent poor fruit soils. Twenty-eight per cent of the 354 farms that have been included in the surveys fell in group 6, and 9 per cent in group 1. The other groups were intermediate in number of farms as well as in soil quality.

"Classifying the farms of the Newfane-Olcott area on the basis of soil differences is essentially the same as a 'land classification' sort, since this is the only criterion used in establishing land class areas that varies to any appreciable degree over the township."

[6] Herrell F. DeGraff, *An Economic Study of Farming in . . . Newfane*, Table 42, p. 98.

Table 24. During the 1913-19 period farm income followed a more or less regular downward progression from group 1 to group 6, but rates of return varied little among groups. In the following decade returns tended to be a little lower, farm income averaging $1,018 as against $1,244 in the earlier period. Again, however, there was little variation among soil groups as to rate of return. But in the depression decade, 1930-39, substantial differences among soil groups developed. Although the average income for all groups declined from $1,018 to $747, the average for group 1 actually increased. Partly because of the increased income, but mainly because of substantially lower valuations placed by farmers on their farms in 1930-39, the rate of return for group 1 was raised to 10.5 percent, which was nearly twice as high as the rate for all groups combined, and almost exactly three times as high as the rate for group 6.

The financial superiority of the higher-grade land is further indicated by the ownership and mortgage history of 71 New-

TABLE 24

Farm Income per Farm and Rate of Return for Newfane Farms, 1913-39, by Soil Group

	Soil Group[a]						
	1	2	3	4	5	6	Average
1913-19							
Farm income[b]	$2,058	$1,680	$1,615	$1,070	$1,028	$778	$1,244
Rate of return[c]	6.7%	9.1%	7.8%	8.0%	8.3%	7.5%	7.7%
1920-29							
Farm income[b]	$1,844	$1,502	$1,414	$1,074	$666	$605	$1,018
Rate of return[c]	6.0%	6.8%	6.0%	6.5%	5.0%	5.2%	5.8%
1930-39							
Farm income[b]	$2,162	$1,153	$812	$480	$406	$273	$747
Rate of return[c]	10.5%	7.4%	5.7%	4.8%	4.3%	3.6%	6.2%

Based on data in *An Economic Study of Farming in the Town of Newfane, Niagara County, New York*, by Herrell F. DeGraff (Cornell University, unpublished Ph.D. thesis, 1941). The data cover 354 farms.

[a] Farms grouped by adaptability of soil to fruit growing, from best (group 1) to poorest (group 6); see text footnote 5.

[b] Farm income as defined in Table B-2, Appendix B.

[c] Ratio of average farm income to average farm capital.

fane farms.[7] The sample includes 60 of the farms covered by the previous income analysis, and 11 other farms for which records were available. The records utilized, which were copied from the Niagara county clerk's office, cover mortgages, transfers, and sometimes price considerations from the date of settlement (around 1835) to 1939. For the mortgage analysis, farms were classified by economic land class, as defined in New York, rather than by soil group, since soils data were unavailable for the eleven farms not included in the income study. In the classification by economic land class, higher numbers indicate better land. Of the 71 farms, 31 fell in classes III and IV, and 40 fell in classes V and VI.[8] Some interesting differences between the two groups are apparent.

The farms in land classes III and IV—that is, on the less productive land—changed hands oftener and were less likely to be transferred through inheritance or other family transactions.[9] The median average length of holding for these farms was five years, which means that half of the owners had possession five years or less; the median for farms in land classes V and VI was ten years. On the good farms 25.5 percent of the owners obtained ownership through inheritance or family connection, which compares with 14 percent for the poor farms.

The owners of the good farms had recourse to mortgage credit less often, and if they did mortgage their farms, they were more likely to get out of debt subsequently. These tendencies are brought out in Table 25, which presents a condensed mortgage history of the 591 owners of the 71 farms studied.

The history of Newfane mortgages, as distinct from farms mortgaged, tells much the same story; mortgages on the good farms were more likely to be paid off, even though they were roughly twice as large. Between the date of settlement and 1939, 529 mortgages were placed on the 71 farms. Often mortgages

[7] Herrell F. DeGraff, *The Ownership and Mortgage History of Farms in the Town of Newfane, Niagara Country, New York* (New York State College of Agriculture, Cornell University, No. A.E. 341, mimeo., March 1941).

[8] In the township of Newfane, soil is the only factor used in economic land classification that varies to any appreciable extent, so that land class and soil groupings for the area are closely correlated. For 60 of the 71 farms in the mortgage study both soil group and land class were known. Eighty percent of the farms in Newfane in land classes V and VI for which soils data were available were in soil groups 1, 2, and 3. These are the groups having the better fruit soils. Only 13 percent of the farms in land classes III and IV were in soil groups 1, 2, and 3.

[9] DeGraff, *The Ownership and Mortgage History of Farms in . . . Newfane*, pp. 9 f.

TABLE 25

Mortgage History of 71 Newfane Farms

Mortgage history	*31 farms in land classes III and IV*		*40 farms in land classes V and VI*	
	Number of owners	Percent of total	Number of owners	Percent of total
Farm never mortgaged	65	20%	69	27%
Mortgaged at first, out of debt later	56	17	59	23
No debt at first, mortgaged later	20	6	18	7
Farm never clear	191	57	113	43
Total	332	100%	259	100%

From Herrell F. DeGraff's *The Ownership and Mortgage History of Farms in the Town of Newfane, Niagara County, New York* (New York State College of Agriculture, Cornell University, No. A.E. 341, mimeo., March 1941), Table 5, page 11. Based on records extending from about 1835 to 1939.

ran concurrently. There are several examples of farms subject to as many as five mortgages for a short space of years. Table 26 recounts the experience of all mortgages taken individually.

TABLE 26

Repayment Performance on 529 Newfane Mortgages

Method of disposal	*Distribution of Mortgages in land classes*				*Average size of mortgages in land classes*	
	III and IV		*V and VI*			
	Number	Percent of total	Number	Percent of total	*III and IV*	*V and VI*
Refinanced	86	30%	63	26%	$1,900	$4,311
Discharged at time of sale	40	14	38	16	2,079	3,382
Foreclosed or deeded back	44	15	24	10	1,840	5,015
Paid out of income[a]	118	41	116	48	1,351	2,366
Total	288	100%	241	100%	$1,676	$3,265

From Herrell F. DeGraff's *The Ownership and Mortgage History of Farms in the Town of Newfane, Niagara County, New York* (New York State College of Agriculture, Cornell University, No. A.E. 341, mimeo., March 1941), Table 10, page 21. Based on records extending from about 1835 to 1939.

[a] Mortgages not discharged by one of the first three methods were assumed to have been paid out of the mortgagor's income, which of course may or may not have been from farm earnings.

Wheat Yields and Land Values in Northern Idaho

Nybroten's study of yields and land values is significant because it indicates that typical rental incomes to the landlord sometimes differ greatly from typical incomes under owner operation.[10] In the area studied, which includes Latah, Lewis, and Nez Perce counties in the western panhandle of Idaho, most of the arable land is devoted to wheat, and much of it is farmed under share lease, with the landlord receiving one-third of the crop. This means that average rentals on different grades of land are proportional to average wheat yields; the rent on land averaging 40 bushels would be twice the rent on land averaging only 20 bushels. But net income to a landowner who farms his own land behaves in a very different fashion from rental income, because of fixed costs. For the period studied, Nybroten estimated that costs were roughly equivalent to 17.5 bushels of wheat per acre, regardless of the yield per acre. Therefore, land averaging 20 bushels would produce a net income to the owner-operator of only 2.5 bushels, compared with the typical rental of 6.7 bushels; but land averaging 40 bushels would produce a net of 22.5 bushels to the owner-operator, compared with the rental of only 13.3 bushels.

According to Nybroten, the discrepancy between rentals to the landlord and net income to the owner-operator had a pronounced effect on land values in the Idaho panhandle. Rental income was the dominating factor. In appraising farms for investment, a prospective landlord would be primarily concerned with expected rentals, which would be directly proportional to average wheat yields, and thus land averaging 40 bushels would be worth twice as much to him as land averaging 20 bushels. An owner-operator, on the other hand, would be concerned with the net income-producing capacity of the land. If Nybroten's costs and returns estimates are correct, land averaging 40 bushels gross and 22.5 bushels net is worth nine times as

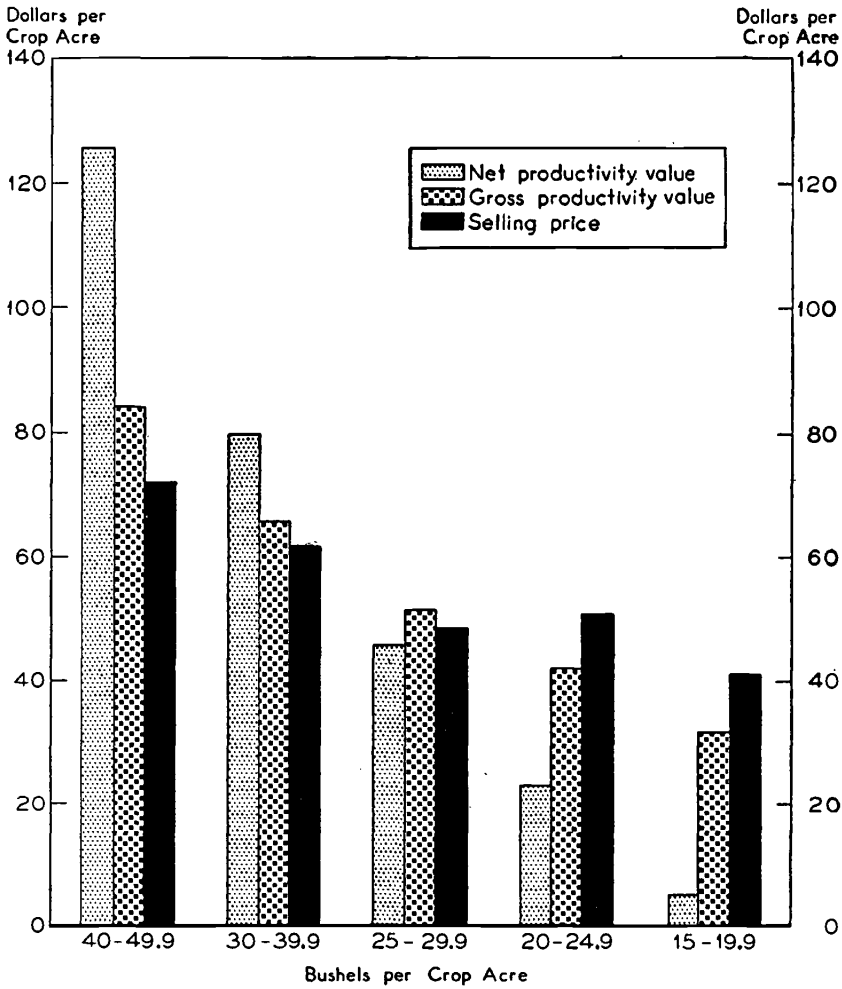
[10] The material reviewed in this section is from *Land Values, Mortgages, Rents, and Wheat Yields of Northern Idaho Wheat Lands*, by A. Norman Nybroten (University of Idaho Agricultural Experiment Station, Bulletin 248, April 1942), pages 13-18. The data on wheat yields "were obtained from a study made cooperatively by the Works Progress Administration and the Department of Agricultural Economics, Agricultural Experiment Station, University of Idaho. Reports of this study were published under the supervision of Paul A. Eke. Several students, some of them paid by the National Youth Administration, assisted in gathering and tabulating the data."

much to an owner-operator as land averaging 20 bushels gross and only 2.5 bushels net.

But in the three counties studied, the landlords seemed to dominate the market and set the price of land. Nybroten reached that conclusion after analyzing 450 farm transfers that occurred in 1936-40. The transferred farms comprised 57,560 crop acres and produced an annual average of 1,702,024 bushels of wheat, or 29.6 bushels per acre. After deduction for expenses, estimated at 17.5 bushels per acre regardless of yield, a total of 694,724 bushels, or 12.1 per acre, remained as net product. The farms sold for a total of $3,174,871, which amounted to $1.87 per bushel of gross product, and $4.57 per bushel of net product after allowance for expenses. The 450 transferred farms were separated into five classes according to average wheat yield, and a "gross productivity value" and a "net productivity value" were calculated for each class. The gross productivity value was determined by setting the gross wheat yield for each class at the midpoint of the range of yields and multiplying it by $1.87. Thus in the class of farms yielding 40 to 49.9 bushels per acre, the gross productivity value per acre was 45 times $1.87, or $84.15. The net productivity value was determined by taking the gross yield for each class, deducting the estimated expenses of 17.5 bushels per acre, and multiplying the remainder by $4.57. Thus in the 40 to 49.9 class, 45 bushels less 17.5 bushels leaves 27.5 bushels, which when multiplied by $4.57 gives a net productivity value of $125.68 per acre.

The two productivity values were then compared with actual selling prices and assessed values. The results (Figure 37) indicate: first, that selling price conforms very closely to gross productivity and hence rental value; second, that selling price does not conform well to net productivity; third, that the operator, whether tenant or owner, will enjoy a far higher return on investment if he farms high-grade land. This, of course, raises the question why the owner-operators, and those who wish to become owner-operators, do not bid up the price of the better land. According to Nybroten, "The reason that land values have not been in these proportions in the past is that the landlord has been able to set values on the basis of receiving a third of the crop. When the prospective land purchaser has estimated what land is worth to him as an operator, he has calculated the value of the share he would have to give a landlord if he were to rent rather than to buy. However, the value arrived at in

Figure 37. Net and Gross Productivity Value and Selling Price for 450 Idaho Farms Transferred in 1936-40, Classified by Average Yield



After a chart in the work of Nybroten cited in footnote 10. For discussion of the chart see accompanying text.

this manner overvalues the poorer land and undervalues the better land."[11]

A second question is raised, concerning the rationale of the rental system. Why do not tenants compete for the privilege of farming the best land by agreeing to pay more than the cus-

[11] *Op.cit.*, p. 17.

tomary one-third? They appear to be doing so to some extent. "There are indications of a growing trend toward breaking away from the customary one-third share rent on all grades of land. Particularly in Lewis County, higher shares are given to the landlord on better land and, in a few instances, less than one-third is given as rent on the poorer-than-average land. Cash rents are taking the lead in this—rising relatively more on the better land. . . . Should this tendency continue to grow, it will have serious effects on the relative values of different grades of land."[12]

Studies of Typical Farms by the Bureau of Agricultural Economics

The Bureau of Agricultural Economics is currently compiling detailed data on the operations of common types of commercial family-operated farms, covering a wide variety of farm technologies and geographical areas. Publications so far have dealt with twenty types, and research on seven more is in progress.[13] For eighteen of the types studied the data are available yearly since 1930, and readily permit calculations of average income, rates of return, and stability of income during roughly the second half of the interwar period. Although these BAE series tell us nothing about variations among individual farms, they tell us a good deal about variations among farming types, and

[12] *Ibid.*, pp. 17 f.

[13] Reports published to date are the following:

Wylie D. Goodsell, Ronald W. Jones, and Russell W. Bierman, *Typical Family-Operated Farms, 1930-45, Adjustments, Costs and Returns*, Bureau of Agricultural Economics, F.M. 55, April 1946.

Farm Costs and Returns, 1945-47, Commercial Family-Operated Farms in 6 Major Farming Regions, Bureau of Agricultural Economics, F.M. 70, September 1948.

H. R. Hochmuth and Wylie D. Goodsell, *Commercial Family-Operated Cattle Ranches, Intermountain Region, 1930-47, Organization, Costs, and Returns*, Bureau of Agricultural Economics, F.M. 71, November 1948.

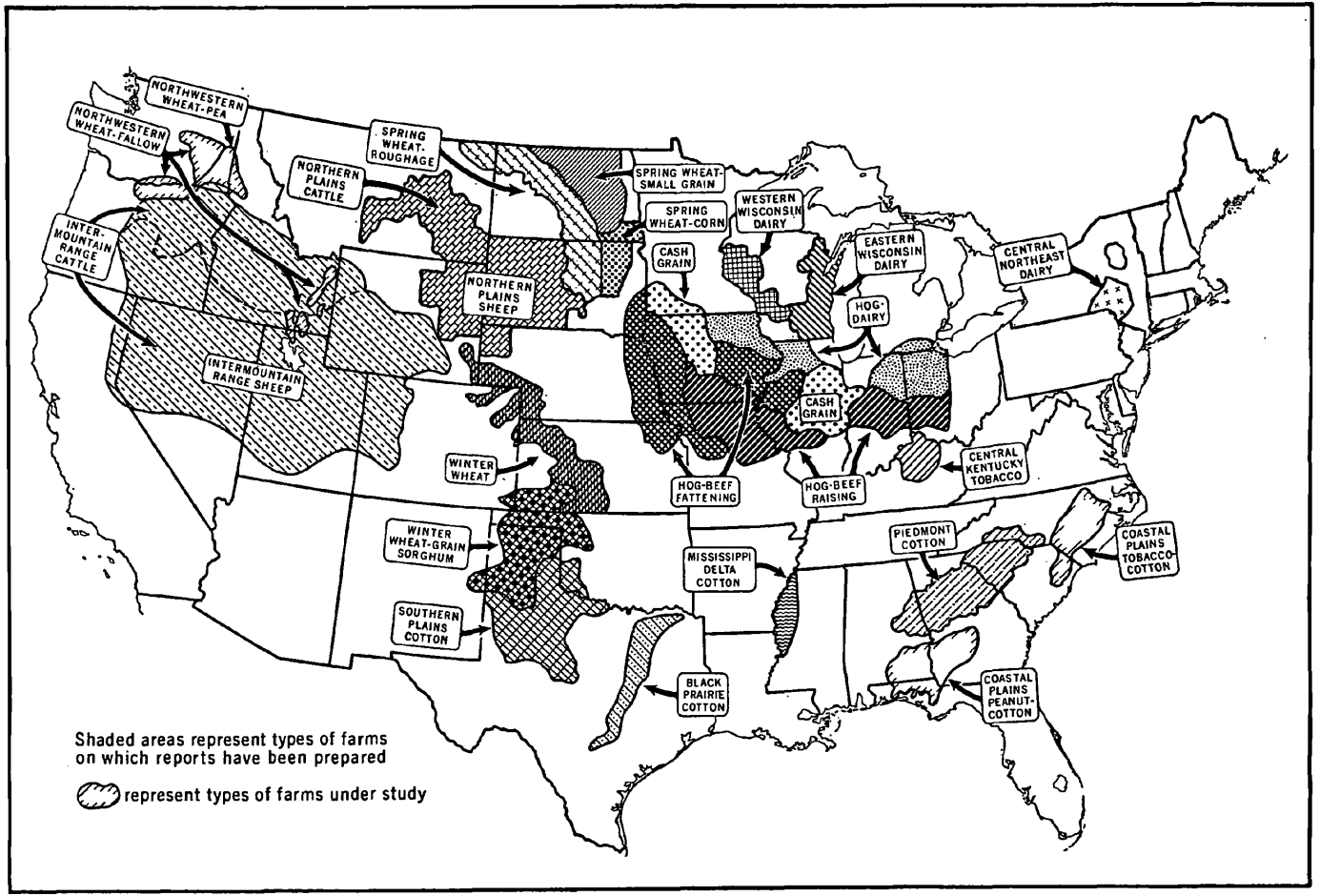
Erling Hole and John H. Bondurant, *Farming in the Bluegrass Area of Kentucky, Operations, Costs, and Returns, 1930-48*, University of Kentucky Agricultural Experiment Station, in cooperation with the Bureau of Agricultural Economics, Bulletin 544, December 1949.

Emil Rauchenstein, Walter W. Wilcox, and Edward J. Smith, *Changes in Dairy Farming in Wisconsin, 1930-48*, University of Wisconsin, Research Bulletin 166, February 1950.

Farm Costs and Returns, 1950 with Comparisons, 16 Commercial Family-Operated Farms in 8 Major Farming Regions, Bureau of Agricultural Economics, F.M. 82, May 1951.

W. Herbert Brown, *Cotton Farming in the Southern Piedmont, 1930-51*, Bureau of Agricultural Economics, Agr. Inf. Bul. 89, June 1952.

Figure 38. Location of Types of Family-operated Farms Studied by the Bureau of Agricultural Economics



Map supplied by U.S. Department of Agriculture, Bureau of Agricultural Economics.
The map locates the farms included in the studies drawn on for Table 27. It is not intended to delineate type-of-farming areas (cf. color map) or

they provide some opportunity to draw comparisons between the income experience of these types and the farm mortgage distress that developed in the areas where the farm types are located (Figure 38).

Certain problems arise in attempting to draw comparisons between BAE income data and mortgage experience in the indicated areas. Most serious, perhaps, is the fact that the BAE farming types, which were originally selected without such comparisons in mind, are not the only types commonly found in the indicated areas.[14] As an extreme example, in the delta cotton area in Mississippi large plantations predominate, and the family-sized farms covered by the BAE represent only about 15 percent of the total crop acreage.

Notwithstanding the difficulties of comparison, certain significant relations stand out in Table 27, which gives BAE information on the profitability of family-operated farms of eighteen types located in areas shown on Figure 38, and summarizes the mortgage experience of all farms in those areas according to the material of Chapter 1. Three measures of profitability are given for the eleven years 1930-40:[15] (1) net operating income, which is cash receipts less cash expenses plus change in inventory; (2) return to operator and family labor, which includes adjustments for farm perquisites and for capital invested; and (3) rate of return, which is here defined as the ratio of net operating income to the value of real estate, machinery, livestock, and crops on hand.[16] Since the measures are basically different, it is natural that some farm types should appear profitable in one respect and unprofitable in another. It is

[14] Throughout the discussion of the BAE material the following statement (Goodsell, Jones, and Bierman, *op.cit.*, page 4) should be kept in mind: ". . . This project is not designed to analyze and represent farm operations and incomes for entire *type-of-farming* areas. . . . [It] is designed rather to study, analyze, and represent farming operations on family-operated farms *by size and type*. Areas are selected for study where a particular type of farm is common even though other types of farms may often be found in the same area. . . . Figure 1, therefore [see Figure 38 of the present text], shows the location of types of farms . . . under study. It should not be interpreted as representing all types of farms in any area or as showing areas represented by types of farms studied."

[15] Though information for earlier years is lacking, the BAE data would permit extension into later years, say through 1945, which of course would result in a substantially different picture of farm incomes. But we have chosen the period 1930-40, covering the depression of the thirties, when so many foreclosures occurred, and also a few years of recovery during the defense period, as the best one for comparison with the various data on which our summary of mortgage experience is based.

[16] For a fuller definition of terms, see Appendix B, particularly Table B-3.

TABLE 27

Selected Asset and Income Items and Rate of Return for 18 Types of Farms, 1930-40, and Mortgage Experience in Areas Where They Were Common

Type of farm[a]	*Average net operating income*[b]	*Average net income earned by operator and family labor*[b]	*Average value of real estate, machinery, livestock, and crops on hand*	*Rate of return*[c]	*Mortgage experience in area*
Central New York					
Dairy	$736	$640	$9,088	8.1%	Good
Southern Wisconsin					
Dairy, eastern	752	450	12,069	6.2	Good
Dairy, western	559	416	8,753	6.4	Poor
Corn Belt					
Cash grain[d]	1,447	685	26,983	5.4	Fair—good
Hog-beef fattening	999	453	21,031	4.8	Fair—good
Hog-beef raising	510	398	10,780	4.7	Poor—good
Hog, dairy	836	616	12,686	6.6	Fair—good
Northern Plains					
Spring wheat, corn, livestock	438	354	12,590	3.5	Poor
Spring wheat, small grain, livestock	274	251	11,887	2.3	Poor
Spring wheat, roughage, livestock	173	229	10,707	1.6	Poor
Southern Plains					
Winter wheat	607	294	18,960	3.2	Poor
Winter wheat, grain sorghum	763	422	18,898	4.0	Poor—good
Cotton, grain sorghum	717	614	8,671	8.3	Good
Texas Black Prairie					
Cotton	740	661	9,305	8.0	Fair—good
Mississippi Delta					
Cotton	488	518	2,952	16.5	Poor—fair
Southern Piedmont					
Cotton	171	152	4,233	4.0	Poor
Central Kentucky					
Tobacco, livestock	597	433	7,383	8.1	Good
Intermountain Region					
Cattle ranches	1,476	561	25,644	5.8	Poor—fair

Data are from the following sources:

For cattle ranches, *Commercial Family-Operated Cattle Ranches, Intermountain Region, 1930-47, Organization, Costs, and Returns*, by H. R. Hochmuth and Wylie D. Goodsell (Bureau of Agricultural Economics, F.M. 71, November 1948), page 14.

For central Kentucky tobacco, *Farming in the Bluegrass Area of Kentucky, Operations, Costs, and Returns, 1930-48*, by Erling Hole and John H. Bondurant (University of Kentucky Agricultural Experiment Station, in cooperation with the Bureau of Agricultural Economics, Bulletin 544, December 1949), page 26.

For eastern and western Wisconsin dairy farms, *Changes in Dairy Farming in Wisconsin, 1930-1948*, by Emil Rauchenstein, Walter W. Wilcox, and Edward J. Smith (University of Wisconsin, Research Bulletin 166, February 1950), Tables 9 and 10, pages 32 f.

For southern piedmont cotton farms, *Cotton Farming in the Southern Piedmont, 1930-51*, by

W. Herbert Brown (Bureau of Agricultural Economics, Agr. Inf. Bul. No. 89, June 1952), Tables 28 and 29, pages 57 f.

For other types, *Typical Family-Operated Farms, 1930-45, Adjustments, Costs, and Returns*, by Wylie D. Goodsell, Ronald W. Jones, and Russell W. Bierman (Bureau of Agricultural Economics, F.M. 55, April 1946).

[a] See Figure 38 for location of farms studied.

[b] For explanation see Appendix B.

[c] Ratio of average net operating income to average value of real estate, machinery, livestock, and crops on hand.

[d] In addition to farms in the areas shown as "cash grain" on Figure 38, farms in a strip extending from southeastern South Dakota through eastern Nebraska into Kansas (lying just west of the westernmost hog-beef fattening farms shown) are included.

striking that four farm types stand out as conspicuously unprofitable on all counts during the eleven-year period—three that are common in the northern plains and the cotton farm type common in the southern piedmont. Mortgage experience was bad in the indicated areas. Possibly a fifth type should be added to the unprofitable category—the winter wheat type common in the southern plains. Again, mortgage experience in the indicated area was poor.

The two types of family-operated farms with the highest net operating income were the cattle ranches in the Intermountain region and the cash grain farms in the Corn Belt. The cash grain farms, moreover, also had the highest return to labor. But because both these types have high capital requirements, their rates of return were substantially less than those of some types having lower requirements—most notably the delta cotton farms in Mississippi. It is quite probable that despite the high capital requirements much higher returns for the cash grain farms would be shown if data for the western segment of farms could have been eliminated. The western part of the relevant area, which is not included on Figure 38, and which extends from southeastern South Dakota through Nebraska and into Kansas, suffered much more from the drought of the thirties than did the sections of Iowa and Illinois where the rest of the cash grain farms were located. Mortgage experience was relatively poor in the indicated western area; in the eastern areas it was relatively good.

Stability of income is also important. Even where earnings are high on the average over a long period, a few consecutive years of low income may prove disastrous. Unless the farmer saves enough during good years to tide him over a bad period, he will certainly have financial difficulties, and he may lose his farm. If the bad years occur early in the life of a mortgage, be-

fore there is opportunity to acquire a surplus, the chances of foreclosure are so much the greater.

An important development affecting loan experience of the thirties was the decline in farm incomes following World War I, a period not covered by BAE records for specific types of farms. Fluctuations during the thirties, however, give some indication of the relative income stability for family-operated farms of the different types (Table 28). One measure of stability is the range of annual incomes, and in connection with mortgage distress the lower end of the range is particularly significant. Ten of the eighteen types had deficits of net operating income in at least one year, and some had deficits in several years. Another measure of stability is the standard deviation of net operating income, which measures variation in absolute dollar amounts.[17] A third measure is the coefficient of variation, which measures relative variation.[18] The eighteen farm types in Table 28 are arranged in order of stability according to the coefficient of variation. At the upper end of the scale, the dairy farms in central New York and the cotton farms in the Texas Black Prairie were relatively stable by all three counts. Mortgage experience in central New York was good, and in the Texas Black Prairie strip was fair to good. At the other end of the scale, the three types in the northern plains that showed up as conspicuously unprofitable were also highly unstable on all counts. Mortgage experience in the northern plains was poor.

Implications of Farm Income Studies

In the first three studies reviewed, it was found that farm land values were not proportional to financial returns during the period covered. In each instance land that was poorly adapted to the type of farming carried on in the area under study was

[17] The standard deviation, also called the root mean square deviation, measures the amount by which individual years differ from the average of all years. The method of computation, apart from short cuts that affect the work but not the results, is as follows: Given N years, X_1, X_2, . . X_1, . . X_N, calculate the deviation of each year from the average, $D_1 = X_1 - X$. Square the deviations (the squares are always positive) and sum them, ΣD_1^2. Divide the sum by the number of years, $\Sigma D_1^2/N$, and extract the square root, $\sqrt{\Sigma D_1^2/N}$.

Usually, about two-thirds of all years will not differ from the average by more than one standard deviation in either direction.

[18] The coefficient of variation is determined by dividing the standard deviation by the average. It is often expressed as a percentage, as in Table 28. The coefficient of variation for New York dairy farms, 32 percent, means merely that the standard deviation is 32 percent of the average. The coefficient of variation may exceed 100 percent of the average.

TABLE 28

Measures of Stability of Net Operating Income for 18 Types of Farms, 1930-40, and Mortgage Experience in Areas Where They Were Common

Type of farm	Range of net operating income		Standard deviation	Coefficient of variation[a]	Mortgage experience in area
	Low	High			
Central New York					
Dairy	$255	$1,070	$239	32%	Good
Texas Black Prairie					
Cotton	258	1,036	262	35	Fair—good
Southern Wisconsin					
Dairy, eastern	219	1,107	307	41	Good
Dairy, western	165	864	257	46	Poor
Central Kentucky					
Tobacco, livestock	136	1,106	292	49	Good
Intermountain Region					
Cattle ranches	—278	2,492	778	53	Poor—fair
Mississippi Delta					
Cotton	102	901	262	54	Poor—fair
Corn Belt					
Hog, dairy	146	1,688	488	58	Fair—good
Southern Plains					
Winter wheat, grain sorghum	—323	1,363	454	60	Poor—good
Cotton, grain sorghum	23	1,374	429	60	Good
Corn Belt					
Cash grain	—46	2,475	909	63	Fair—good
Southern Plains					
Winter wheat	—199	1,288	403	66	Poor
Southern Piedmont					
Cotton	—77	327	139	81	Poor
Corn Belt					
Hog-beef fattening	—368	2,080	896	90	Fair—good
Hog-beef raising	—227	1,300	507	99	Poor—good
Northern Plains					
Spring wheat, corn, livestock	—383	1,304	570	130	Poor
Spring wheat, small grain, livestock	—613	1,154	594	217	Poor
Spring wheat, roughage, livestock	—533	870	450	260	Poor

For sources of basic data see notes to Table 27.

[a] Standard deviation in percent of average net operating income.

valued higher in relation to financial returns than well-adapted land. To put it another way, rates of return were higher on well-adapted land than on poorly adapted land. Under such circumstances, it follows that if appraisals for loan purposes closely approximate market values for farm land, and if large numbers of loans are made on the basis of a fixed percentage of the

appraised value of the mortgaged properties, then the loans on the poorly adapted land will have less favorable earnings coverage than loans on the well-adapted land.

That appears to have been the actual experience in many areas throughout the United States. Numerous studies of farm income during the interwar period have been made, and many of them reveal the same general relationship between farming returns and land values as were found in Frederick county, the Newfane area, and northern Idaho. Lenders, particularly until the late twenties, apparently were strongly influenced by current market values in making appraisals for loan purposes, and the loan-to-value ratios of a high proportion of their loans fell within a narrow range. As a result, loans on the less productive grades of land had, in many areas, poorer earnings coverage than loans on the better land, and a much higher proportion of them were foreclosed during the interwar period. This, of course, leaves unanswered the question of why deviations between market values and earning capacity persist, and of why lenders, at least during the period under review, failed to adjust loans to the debt carrying capacity of individual farms. These questions, and the problem of adjusting standards to take account of repayment capacity as well as asset values, will be discussed in the next chapter.