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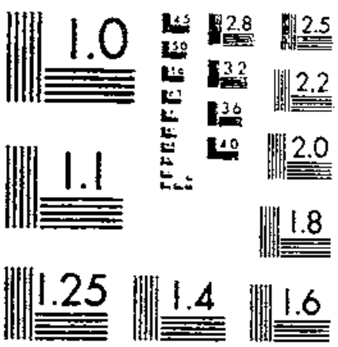

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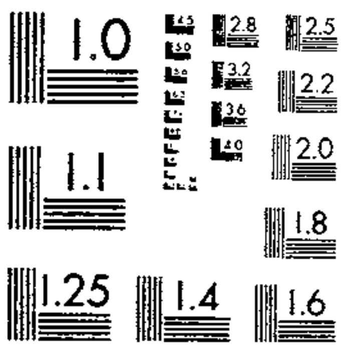

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Technical Bulletin No. 1492

ESTIMATING THE INCOME SUPPLEMENT IN FARM PROGRAM PAYMENTS

Economic Research Service U.S. Department of Agriculture
In Cooperation With Colorado State University

ABSTRACT

The direct Government payments made to farmers under the Agricultural Act of 1970 have the purposes of encouraging needed production adjustments and supplementing farm income. This report develops a conceptual approach and utilizes it to estimate the income supplement share in 1972 farm program payments.

Of the total direct payments of $3,531 million for feed grains, wheat, and cotton under the 1972 program, 25 percent of the feed grain payment, 48 percent of the wheat payment, and 92 percent of the cotton payment are estimated as income supplement. Of the total, about 46 percent, or $1,642 million, is estimated as income supplement for 1972. These estimates of income supplement are based on the concept of a discriminating monopsonist. The minimum payments required to achieve 1972 levels of set-aside with the Government acting as a discriminating monopsonist are classified as production adjustment payments. All payments in excess of this amount are classified as income supplement payments.

Keywords: Policy implications, Government programs, Payments, Acreage diversions, Methodology.

PREFACE

On June 4, 1969, in a statement before the Subcommittee of the Senate Appropriations Committee, then Secretary of Agriculture Clifford M. Hardin presented estimates of income supplement contained in direct Government payments for the 1968 crop. He explained that Government payments consisted of a share that was compensation for income foregone on acres diverted and a remaining share that was an addition to income. This report presents similar estimates for the 1972 crop. It points out some of the theoretical considerations in defining income supplement payments under the Agricultural Act of 1970, develops more refined procedures than those used in making the earlier estimates, and utilizes these procedures for making 1972 estimates for cotton, wheat, and feed grains.

This analysis of income supplement payments is based on a continuing study of aggregate production response and resource adjustments to changes in Government programs by the Aggregate Production Analysis Team, Economic Research Service. Regional analyses for this study were conducted by W. Herbert Brown, Herbert R. Hinman, Wilmoth C. McArthur, LeRoy C. Rude, Jerry A. Sharples, P. Leo Strickland, and Thomas A. Miller.

CONTENTS

	Page
SUMMARY	iv
THE QUESTION OF INCOME SUPPLEMENT	1
A CONCEPTUAL MODEL	1
THREE SELECTED EXAMPLES	4
Great Plains Wheat Program	4
Great Plains Grain Sorghum Program	6
South Central Cotton Program	7
COTTON, FEED GRAIN, AND WHEAT ESTIMATES	11
SPECIAL PROBLEMS ENCOUNTERED IN THE ANALYSIS	13

Washington, D.C. 20250

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SUMMARY

As much as $1.6 billion of the $3.5 billion paid to farmers under the 1972 cotton, feed grain, and wheat programs is estimated to represent income supplement. The remaining $1.9 billion is the theoretical minimum cost of obtaining the production adjustment objectives of these programs. These estimates indicate that 25 percent of the feed grain program payments, 48 percent of the wheat program payments, and 92 percent of the cotton program payments were income supplements, or payments in excess of the theoretical minimum required to attain the production adjustment achieved by these programs.

The minimum payment for production adjustment is considered to be the amount necessary to compensate participants for the income foregone on land withheld from production. This amount approximates the actual minimum which would have been required to induce voluntary participation in the 1972 program.

The income supplement proportions vary among the commodities because of program differences. In the 1972 cotton program, the payment was much larger than required to induce the desired set-aside acreage. Consequently, a very high percentage of the payment was classified as income supplement. For the wheat program the payment rate of $1.34 per bushel was significantly higher than the expected net returns from wheat. Therefore, a fairly high proportion of the direct payment for wheat was also income supplement. Under the feed grain program, payments were more in line with expected net returns from idled land and a higher percentage of the total payment was required to obtain production adjustment.

The income supplement proportion in payments for required set-aside acreage is much higher than in payments for additional set-aside acreage. Depending on the actual intent of the Agricultural Act of 1970, this result may offer some clues to possible revisions in the program structure to better accomplish those program goals that should receive greater emphasis. Higher payment rates and low set-aside requirements result in larger income supplements, as with the 1972 cotton program. Lower payment rates and higher required set-aside acreage would result in smaller income supplements.

Numerous problems must be considered in interpreting the results. One problem is that the concept of income supplement used here may be a more rigorous definition than many people have in mind when they speak of income supplement payments. It may be impossible to administer a voluntary production adjustment program with no income supplement. Moreover, these estimates assume that farmers consider only first-year profits when considering whether or not to participate in farm programs. Other considerations may actually raise or lower the payment required to induce participation. Another problem in making such estimates is a lack of data on farmers' price expectations when they make their participation decision.

ESTIMATING THE INCOME SUPPLEMENT IN FARM PROGRAM PAYMENTS

by

Thomas A. Miller[1]

THE QUESTION OF INCOME SUPPLEMENT

Direct Government payments to farmers under the current farm commodity programs have three basic purposes: (1) They compensate for income foregone on land diverted from crop production, (2) they induce production not elicited by the market, and (3) they supplement farm income while price support loan levels are permitted to reflect world price levels. Little information is available concerning the actual proportions of direct payments under the various Government commodity programs that serve these three different purposes. Furthermore, neither the language of the commodity programs nor the way in which they are administered differentiates the specific purposes of the payments. This study develops a conceptual model to estimate the income supplement component of payments and provides estimates of income supplement under the 1972 feed grain, wheat, and cotton programs.

Information on the extent that current direct payments to farmers are actually income supplement payments has several applications. First, the question of payment limitations has differing implications when separate limits are considered for income supplement payments and for production adjustment payments.[2] Limits on income supplement payments may achieve a welfare goal by limiting payments to wealthy producers. Limits on production adjustment payments merely reduce the effectiveness of the supply control mechanism.

Second, questions concerning the extent of capitalization of Government program payments into asset values involve the distinction between income supplement payments and production adjustment payments. This distinction is required because the production adjustment share of the payment is compensation for income foregone and thus is not capitalized into asset values. Thus, accurate measurement of the income supplement proportion of program payments is necessary to design any "buy-back" system to compensate farmers for loss in asset values that would result from phasing out farm programs. A recent publication by Reinsel and Krenz treats this problem.[3]

Finally, the distributions of the two categories of payments to farmers theoretically should differ because they provide solutions to different problems. Payments for production adjustment should be proportional to the adjustment. The income supplement should be distributed by other criteria. However, a few studies suggest that the distributions are probably not different for the current programs. Schultze in particular suggests that the two types of payments have nearly identical recipients.[4] Identifying these two components of program payments and measuring their respective distributions over farms is a necessary step toward correcting this problem.

A CONCEPTUAL MODEL

A simple theoretical response model is useful to distinguish income supplement payments from production adjustment payments. First, assume a distribution of expected net returns over variable costs for all acres in the population of interest as shown in figure 1. This

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[2] This study uses the term "production adjustment payments" to include both payments for land diverted from crop production and payments to induce production.

[3] Reinsel, Robert D., and Ronald D. Krenz. *Capitalization of Farm Program Benefits into Land Values.* U.S. Dept. Agr., ERS-506, 25 pp., Oct. 1972.

[4] Schultze, Charles L. *The Distribution of Farm Subsidies—Who Gets the Benefits?* Staff paper for the Brookings Institution, Washington, D.C., 51 pp., 1971.

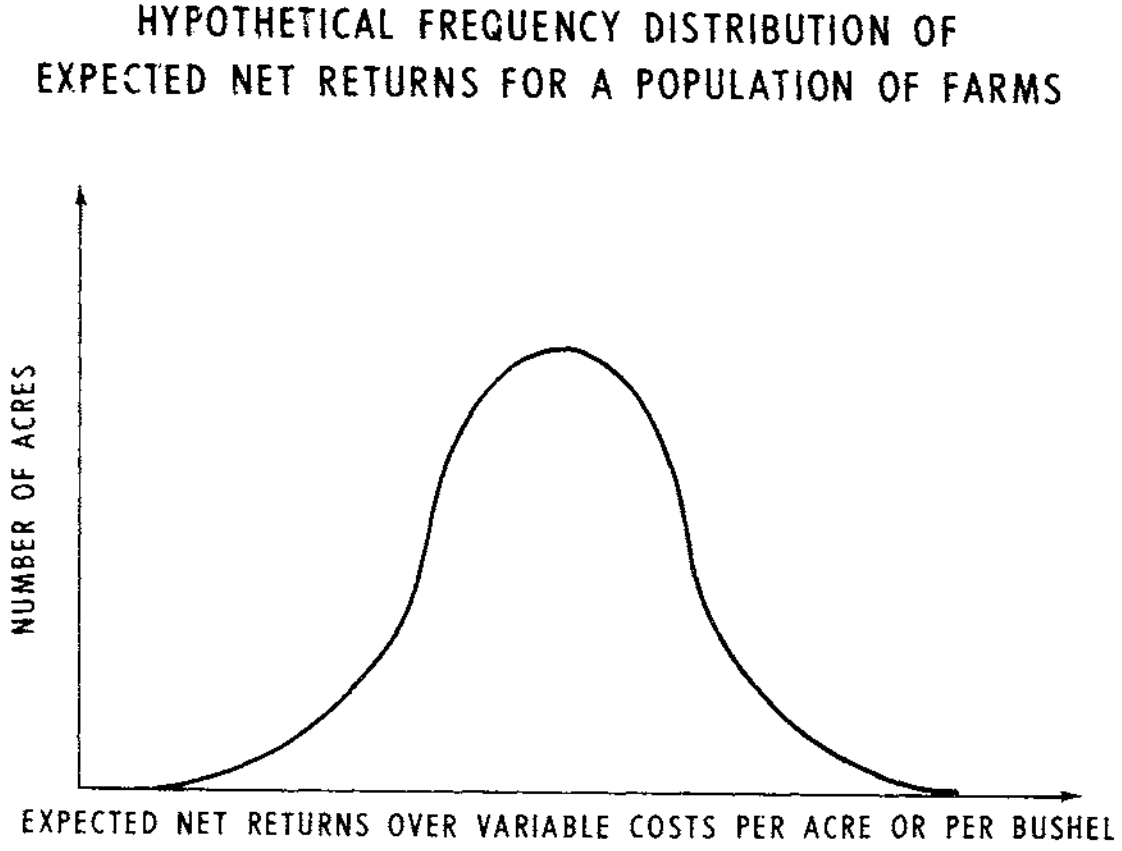

Figure 1

distribution is assumed bell shaped, and may be shown on a per acre or per bushel basis.[5] Now, assume a hypothetical land retirement program under which the Government offers producers a uniform payment per bushel of normal yield to set aside 25 percent of their cropland, and that all cropland within farms is homogeneous. Participation in this program is voluntary and we assume that producers are economically rational; that is, they will participate in the program whenever the Government payment exceeds their expected net returns from the set-aside cropland if it were planted. Curve OBEG in figure 2 shows the hypothetical relationship between the payment rate for set-aside and the acres of cropland set aside. For low payment rates, cropland with low expected net returns will be enrolled in the program. As the payment rate increases, additional producers enter the program, with set-aside acreage accelerating until about half the eligible cropland is enrolled. Beyond this point, participation increases at a decreasing rate until the payment is high enough to attract the cropland with the highest expected net return. The result is the "lazy S" response curve shown as OBEG in figure 2. In mathematical terms, curve OBEG represents the cumulative distribution corresponding to the net returns distribution shown in figure 1.

Now assume the program payment rate is OD as shown in figure 2, and that farmers participate in the program to the extent that OF acres are set aside. The total direct payments to producers under this program are represented by area ODEF. This total direct payment (ODEF) may be divided into income supplement payments and production adjustment (set-aside) payments in the following manner. Consider producers with very low expected net returns who would be willing to participate in the program at payment rate OA. These producers would divert OC acres at this payment rate. However, because the Government program offers a uniform payment rate, these producers actually receive payment rate OD, or an excess payment of AD over the minimum amount required to induce them to participate

[5] Returns per acre can always be converted to returns per bushel by dividing by the normal yield determined by the Agricultural Stabilization and Conservation Service (ASCS), U.S. Department of Agriculture. Since payments to farmers are based on ASCS normal yields, these yields are the appropriate denominator rather than the farmer's expected yields per acre.

HYPOTHETICAL RELATIONSHIP BETWEEN
SET-ASIDE ACRES AND PAYMENT RATE

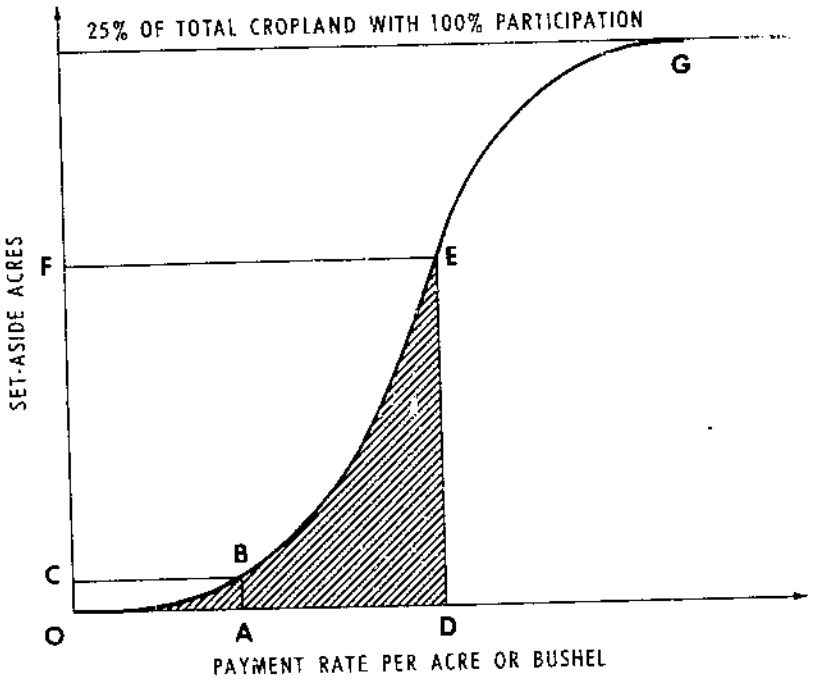

Figure 2

in the program. This excess payment may be viewed as an income supplement payment. Alternatively, the payment actually required for participation—payment OA—may be defined as a production adjustment payment.

For all set-aside acres, the area OBEF above the response curve may be defined as a production adjustment payment. The area OADEB below the response curve may be defined as an income supplement payment. In technical terms, the production adjustment payment is the minimum payment that would be necessary to achieve set-aside OF with the Government acting as a discriminating monopsonist.[6] In actual fact, the U.S. Department of Agriculture sets the direct payment formula high enough to attract the bulk of producers. Consequently, it is substantially higher than absolutely necessary to attract many marginal participants. Theoretically, payments as small as OBEF could be used to achieve the OF level of set-aside through a bid system of land retirement. Under such a system each producer is paid exactly what he requires to participate in the program and no more. This is the primary way that land retirement programs which are operated on a bid basis have the potential for gaining efficiency, as shown by Zepp and Sharples.[7]

The definition of income supplement payments represented by the shaded portion of figure 2 is used for the remainder of this analysis. This definition was chosen because it provides a rigorous analytical model to estimate the income supplement proportion of Govern-

[6] The concept of a discriminating monopsonist is discussed in Bronfenbrenner, Martin, *Income Distribution Theory*, Aldine-Atherton, Inc., Chicago, 1971, pp. 199-204. Utilizing the concept of a discriminating monopsonist in the evaluation of direct payments to farmers is suggested by Schultze, op. cit., p. 43. This concept provides a rigorous economic basis for estimating income supplement payments. However, this definition was not used for the 1968 estimates of income supplement discussed in the preface. As a result, the earlier estimates are not exactly comparable to the estimates made here.

[7] Zepp, Glenn A., and Jerry A. Sharples. *General Cropland Retirement—Analysis of Four Alternatives*. U.S. Dept. Agr., ERS-462, 32 pp., Apr. 1971.

ment payments. Limitations of this definition and problems encountered in using it are discussed in the last section.

THREE SELECTED EXAMPLES

For the actual estimation of income supplement payments, the United States was divided into the seven producing regions shown in figure 3. Examples of regional analyses for specific crops show how the conceptual model was used to estimate the proportion of income supplement payments under the 1972 commodity program. The examples presented below—wheat and grain sorghum in the Great Plains and cotton in the South Central region—cover some of the major relationships encountered and decisions made in using the procedure.

Great Plains Wheat Program

The 1972 wheat program in the Great Plains provides the first example. The first step in the process was to estimate the distribution of expected net returns for wheat in the Great Plains. (See fig. 4.) A few clues to the distribution were gained from the 1970 wheat enterprise budgets maintained by the Economic Research Service (ERS).[8] The budgets suggested that the distribution of expected net returns was bell shaped and nearly symmetrical (fig. 4). With farmers' 1972 price expectations, the budgets show an average expected net return of $0.74 per bushel.[9] As discussed under the theoretical example, farmers who anticipate actual yields to be significantly higher than ASCS normal yields may have expected net returns that are higher than the market price. Thus, based on the ASCS normal yield, figure 4 shows the distribution of expected net returns for wheat rising to about $1.50 per bushel.

In the 1972 Great Plains wheat program, farmers set aside 7,707,000 acres under the minimum or required provision of the program, and 2,810,000 acres under the provision for additional set-aside (table 1). In return, they received payments of $336.4 million for the required set-aside and $71.9 million for the additional set-aside (table 2). Figure 5 shows the expected relationship in the Great Plains between acres set aside in the wheat program and the set-aside payment rate per bushel (or wheat certificate value). Because wheat certificates were paid on the entire domestic allotment but required set-aside was only 83 percent of the allotment, the effective payment rate on set-aside acres was the wheat certificate payment divided by 0.83. In figure 5, the horizontal axis shows payment rates expressed both ways. In 1972 the wheat certificate value was $1.34. This was equal to a payment of $1.61 per bushel on acres actually set aside.

The response curve OFD on figure 5 is drawn based on the estimated distribution of expected net returns shown in figure 4. It begins at zero set-aside and increases at an increasing rate until it reaches what corresponds to the highest point on figure 4—the payment rate of $0.74 per bushel. At this payment rate about half of the acreage is expected to participate in the program as shown by point F on figure 5. After this point is reached, participation increases at a decreasing rate until 7,707,000 acres are set aside as shown in figure 5. This level is within 2 percent of the 7,880,000 acres that would have been set aside if all farmers had participated in the program.

The entire area OCDE shown in figure 5 represents the $336.4 million payment to Great Plains farmers for the required set-aside acreage because it is the product of payment rate and set-aside acres. Utilizing the definition of income supplement payments as the area below the response curve in figure 5, the proportion in the Great Plains is estimated measuring the ratio of area OCDF to area OCDE. Area OCDF is approximately 53 percent of the total area.[10] Therefore, of the 1972 total payments of $336.4 million for required set-aside in the Great

[8] Miller, Thomas A. *Selected U.S. Crop Budgets: Yields, Inputs, and Variable Costs—Volume 3, Great Plains Region.* U.S. Dept. Agr., ERS-459, 184 pp., Apr. 1971.

[9] The appropriate commodity prices to use for this purpose are the prices that farmers expected when the decision was made to participate in the 1972 program. During the enrollment period in February 1972 when this decision was made, we estimate farmers had price expectations of $1.15 per bushel for corn, $1.25 per bushel for wheat, and $0.25 per pound for cotton lint. Other feed grains were assumed to be priced on a corn-equivalent basis.

[10] The role of the crop enterprise budgets, particularly in estimating the average expected net returns for wheat, is critical to this procedure. Note on figure 5 that the location of point F in horizontal space is the prime determinant of the proportion of the area below and to the right of the response curve. Lower expected net returns by farmers would cause the curve to shift to the left and result in classification of a higher proportion of the total payments as income supplement. Higher expected net returns would result in a lower proportion being classified as income supplement.

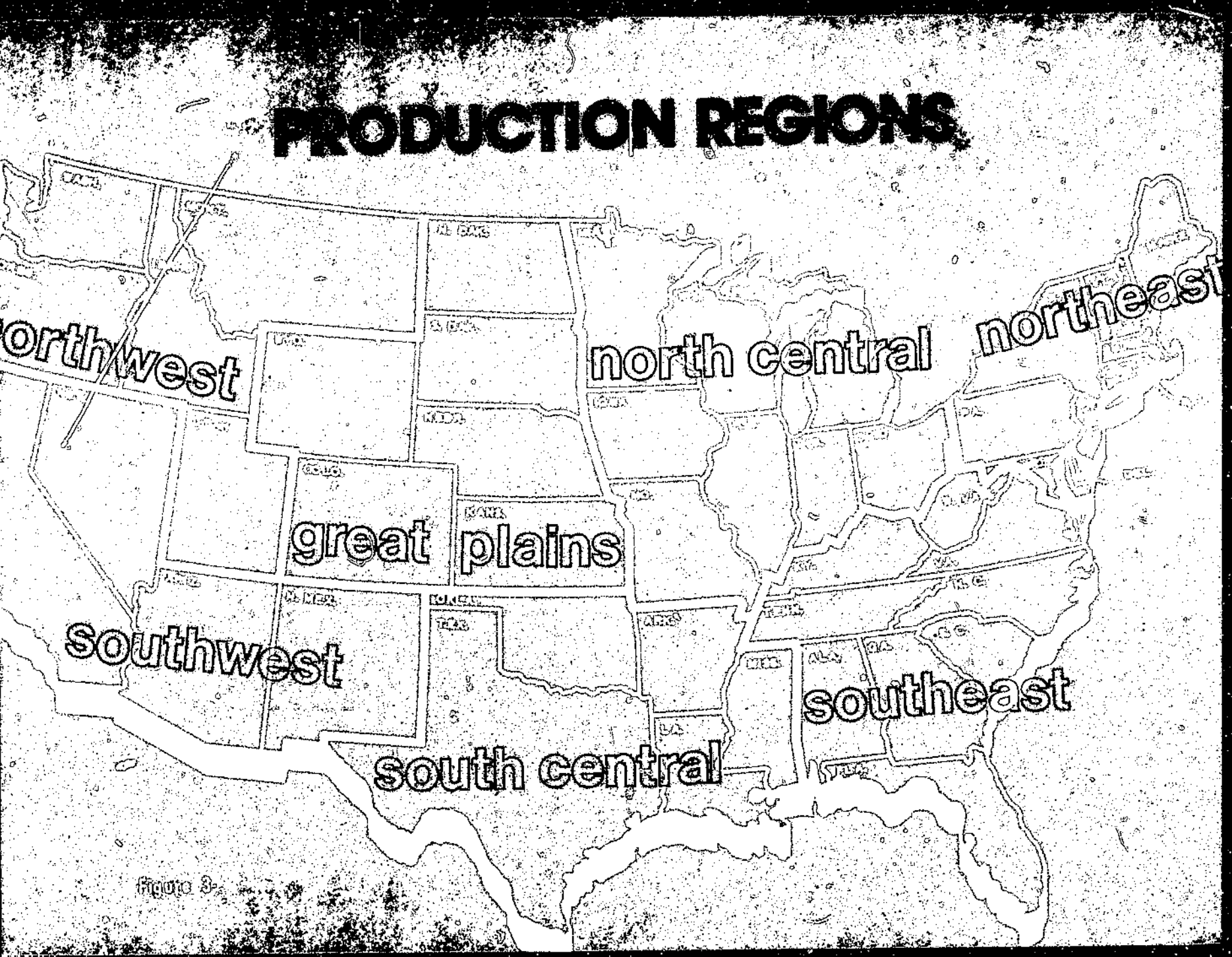
PRODUCTION REGIONS
orthwest
north central
northeast
great plains
southwest
southeast
south central

Figure 3.

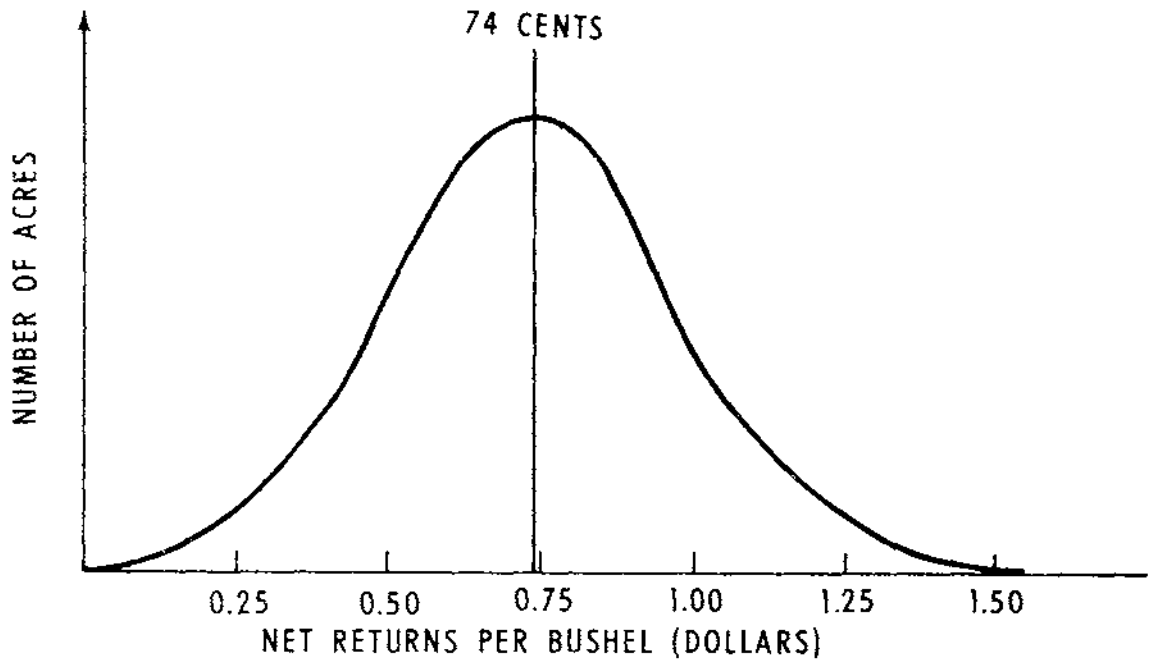

Figure 4

Plains, 53 percent, or $178.3 million, may be classified as income supplement and 47 percent, or $158.1 million, may be viewed as payment for production adjustment.

In a similar manner a portion of the 1972 payment of $71.9 million for additional wheat set-aside in the Great Plains may also be classified as income supplement payment. In figure 5, OBMN represents this payment. The response curve for this program option is below the response curve for required set-aside because of the 1972 requirement that farmers with additional set-aside had to limit or plow up wheat acreage. Point M is known from 1972 ASCS data. The income-supplement proportion of the payment is represented by the proportion that area OBM is to the total area OBMN. This proportion is about 27 percent, suggesting that $19.6 million of the $71.9 million payment for additional set-aside in the Great Plains wheat program is income supplement. The payment for additional wheat set-aside therefore contains a lower proportion of income supplement than the required set-aside or wheat certificate payment.

Great Plains Grain Sorghum Program

The 1972 grain sorghum program in the Great Plains provides a second example. Under this program 2,109,000 acres were set aside under the required option and 754,000 acres were set aside under the additional option as shown in table 1. Table 2 shows that $78.5 million was paid for the required set-aside and $20.4 million was paid for the additional set-aside in 1972.

In figure 6, curve OMFD is the estimated response curve for set-aside acreage as a function of payment rate for grain sorghum. Point F represents the average expected net returns from grain sorghum in the 1970 ERS enterprise budgets of $0.55 per bushel and about one-half of the potential set-aside acreage. Points M and D are known from 1972 ASCS data. The announced 1972 grain sorghum payment rate of $0.39 per bushel was paid on one-half of the grain sorghum base; however, farmers were required to set aside only 25 percent of this acreage. Therefore, the equivalent pay-

Table 1—Set-aside acreage under different set-aside program provisions, by region, 1972

Item	South-east	South Central	South-west	North-east	North Central	Great Plains	North-west	U.S. total
				1,000 acres				
Feed grain program:								
Corn:								
Required set-aside	2,247	561	26	359	10,723	3,863	61	17,840
Additional set-aside	1,137	270	11	180	3,647	1,298	29	6,572
Total	3,384	831	37	539	14,370	5,161	90	24,412
Grain sorghum:								
Required set-aside	55	2,575	209	2	164	2,109	1	5,115
Additional set-aside	29	1,143	131	1	105	754	1	2,164
Total	84	3,718	340	3	269	2,863	2	7,279
Barley:								
Required set-aside	56	191	255	37	348	1,671	821	3,379
Additional set-aside	22	62	118	14	140	826	365	1,547
Total	78	253	373	51	488	2,497	1,186	4,926
Required feed grain set-aside	2,358	3,327	490	398	11,235	7,643	883	26,334
Additional feed grain set-aside	1,188	1,475	260	195	3,892	2,878	395	10,283
Total	3,546	4,802	750	593	15,127	10,521	1,278	36,617
Wheat program:								
Required set-aside	273	2,580	221	184	1,876	7,707	2,194	15,035
Additional set-aside	6	1,128	98	5	152	2,810	872	5,071
Total	279	3,708	319	189	2,028	10,517	3,066	20,106
Cotton program:								
Required set-aside	401	1,423	174	–	51	–	–	2,049
Three programs:								
Required set-aside	3,032	7,330	885	582	13,162	15,350	3,077	43,418
Additional set-aside	1,194	2,603	358	200	4,044	5,688	1,267	15,354
Total	4,226	9,933	1,243	782	17,206	21,038	4,344	58,772

Source: Agricultural Stabilization and Conservation Service. *1972 Set-Aside Programs Annual Report.* U.S. Dept. Agr., Washington, D.C., Feb. 1973.

ment rate for the required set-aside was $0.39 divided by 0.5 or $0.78 per bushel as shown by OC in figure 6.

The proportion of the $78.5 million payment that is income supplement is the proportion area OCDFM makes up of the total area OCDE, or 34 percent. In a similar manner, the income-supplement proportion of the $20.4 million payment for additional set-aside is 27 percent.

South Central Cotton Program

A third example is provided by cotton in the South Central region. Here a more detailed technique was used to estimate the distribution of expected net returns over variable costs. First, the returns over variable cost per pound of lint were determined for each of the ERS cotton budgets using a $0.25 per pound price.[11] Through the use of a regional linear programming model, these budgets were then evaluated to identify the specific combination of budgets that would be expected to represent the actual net returns for the cotton acreage in the region. These budgets were used to estimate the distribution of expected net returns for cotton by

[11] Strickland, P. L., and R. Lynn Harwell. *Selected U.S. Crop Budgets: Yields, Inputs, and Variable Costs—Volume 5, South Central Region.* U.S. Dept. Agr., ERS-461, 184 pp., Sept. 1971.

Table 2—Direct payments to farmers under different set-aside program provisions, by region, 1972

Item	South-east	South Central	South-west	North-east	North Central	Great Plains	North-west	U.S. total
	Million dollars							
Feed grain program:								
Corn:								
Required set-aside	110.1	21.7	1.9	21.8	775.6	209.1	3.5	1,143.7
Additional set-aside	40.8	7.3	.6	7.8	217.1	50.4	1.1	325.1
Total	150.9	29.0	2.5	29.6	992.7	259.5	4.6	1,468.8
Grain sorghum:								
Required set-aside	1.9	119.4	11.9	.1	8.5	78.5	1	220.4
Additional set-aside	.8	37.8	5.1	—	4.7	20.4	—	68.8
Total	2.7	157.2	17.0	.1	13.2	98.9	.1	289.2
Barley:								
Required set-aside	1.5	3.1	8.4	1.2	9.4	38.0	21.1	82.7
Additional set-aside	.4	.6	2.3	.3	2.4	12.4	6.1	24.5
Total	1.9	3.7	10.7	1.5	11.8	50.4	27.2	107.2
Required feed grain set-aside	113.5	144.2	22.2	23.1	793.5	325.6	24.7	1,446.8
Additional feed grain set-aside	42.0	45.7	8.0	8.1	224.2	83.2	7.2	418.4
Total	155.5	189.9	30.2	31.2	1,017.7	408.8	31.9	1,865.2
Wheat program:								
Required set-aside	15.8	101.5	11.4	12.2	112.5	336.4	136.7	726.5
Additional set-aside	.2	26.0	2.7	.2	4.7	71.9	26.5	132.2
Total	16.0	127.5	14.1	12.4	117.2	408.3	163.2	858.7
Cotton program:								
Required set-aside	157.7	503.0	125.7	—	20.9	—	—	807.3
Three programs:								
Required set-aside	287.0	748.7	159.3	35.3	926.9	662.0	161.4	2,980.6
Additional set-aside	42.2	71.7	10.7	8.3	228.9	155.1	33.7	550.6
Total	329.2	820.4	170.0	43.6	1,155.8	817.1	195.1	3,531.2

Source: Agricultural Stabilization and Conservation Service. *1972 Set-Aside Programs Annual Report.* U.S. Dept. Agr., Washington, D.C., Feb. 1973.

plotting and fitting a curvilinear regression line through the plots. The resulting curve is shown in figure 7. The estimated distribution is skewed to the right, has a mean of about $0.06 per pound of lint, and extends upward to about $0.14 per pound of lint. Note that a part of the acreage (actually about 13 percent) was operated by producers with negative net return expectations. Such producers continued to plant cotton with negative net returns at market prices because the Agricultural Act of 1970 requires that cotton be planted to obtain Government cotton payments.

Tables 1 and 2 show that 1,423,000 acres were set aside under the 1972 cotton program in the South Central region at a cost of $503 million. Figure 8 shows response curve ODC for cotton set-aside acreage as a function of payment rate, based on the assumption of economic rationality and the distribution of expected cotton net returns. Since the minimum set-aside acreage for cotton was 20 percent of the allotment and the payment rate of $0.15 per pound of lint was paid on the entire allotment, the equivalent payment rate per pound of lint on the set-aside acreage was $0.15 divided by 0.2 or $0.75, as shown by OB on the figure. The income-supplement proportion of the total payment is the ratio of area OBCD to the total area OBCF, or about 92 percent of the total payment of $503 million.

ESTIMATED RELATIONSHIP BETWEEN SET-ASIDE ACRES IN THE GREAT PLAINS WHEAT PROGRAM AND THE SET-ASIDE PAYMENT RATE, 1972

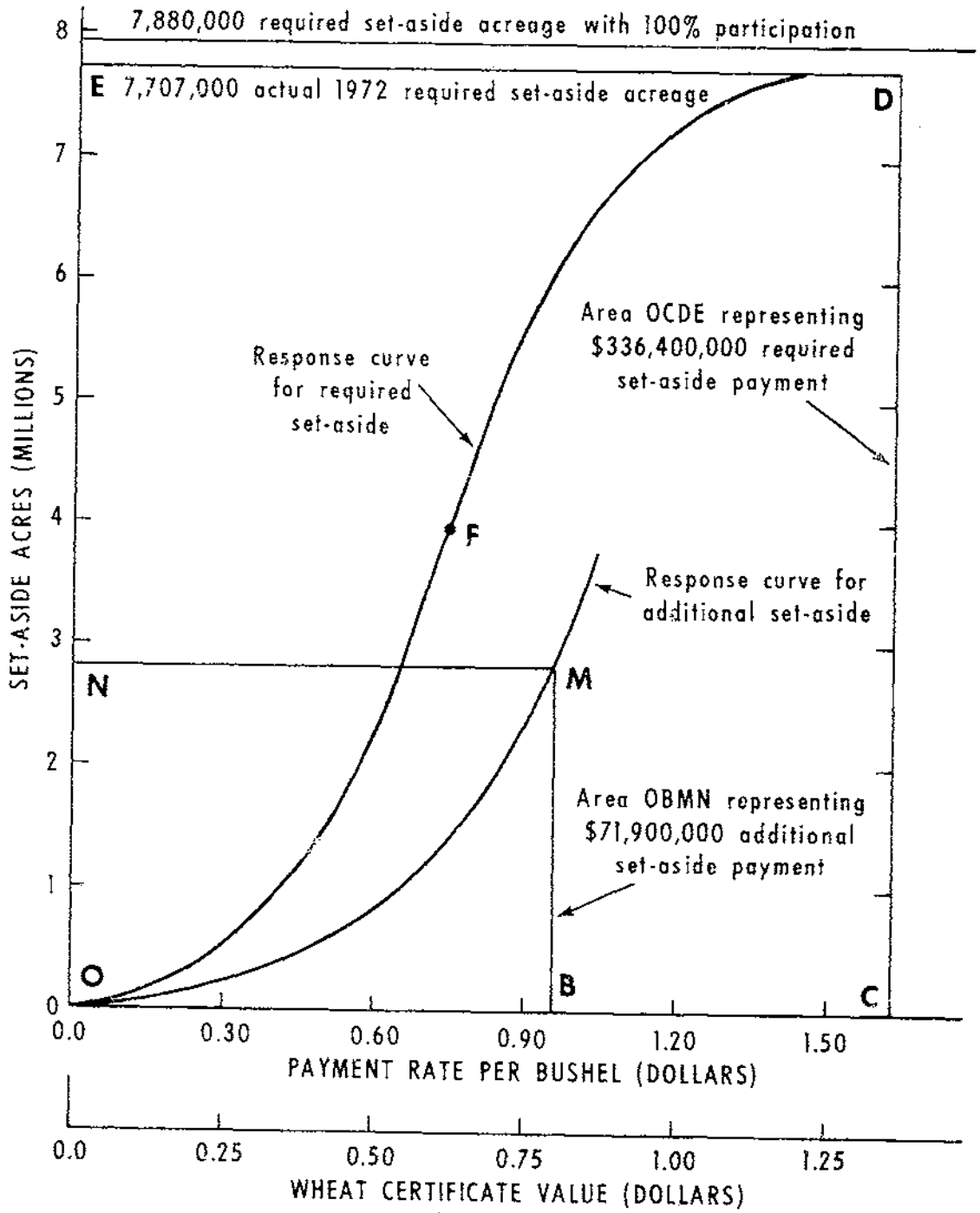

Figure 5

ESTIMATED RELATIONSHIP BETWEEN SET-ASIDE ACRES IN THE GREAT PLAINS GRAIN SORGHUM PROGRAM AND THE SET-ASIDE PAYMENT RATE, 1972

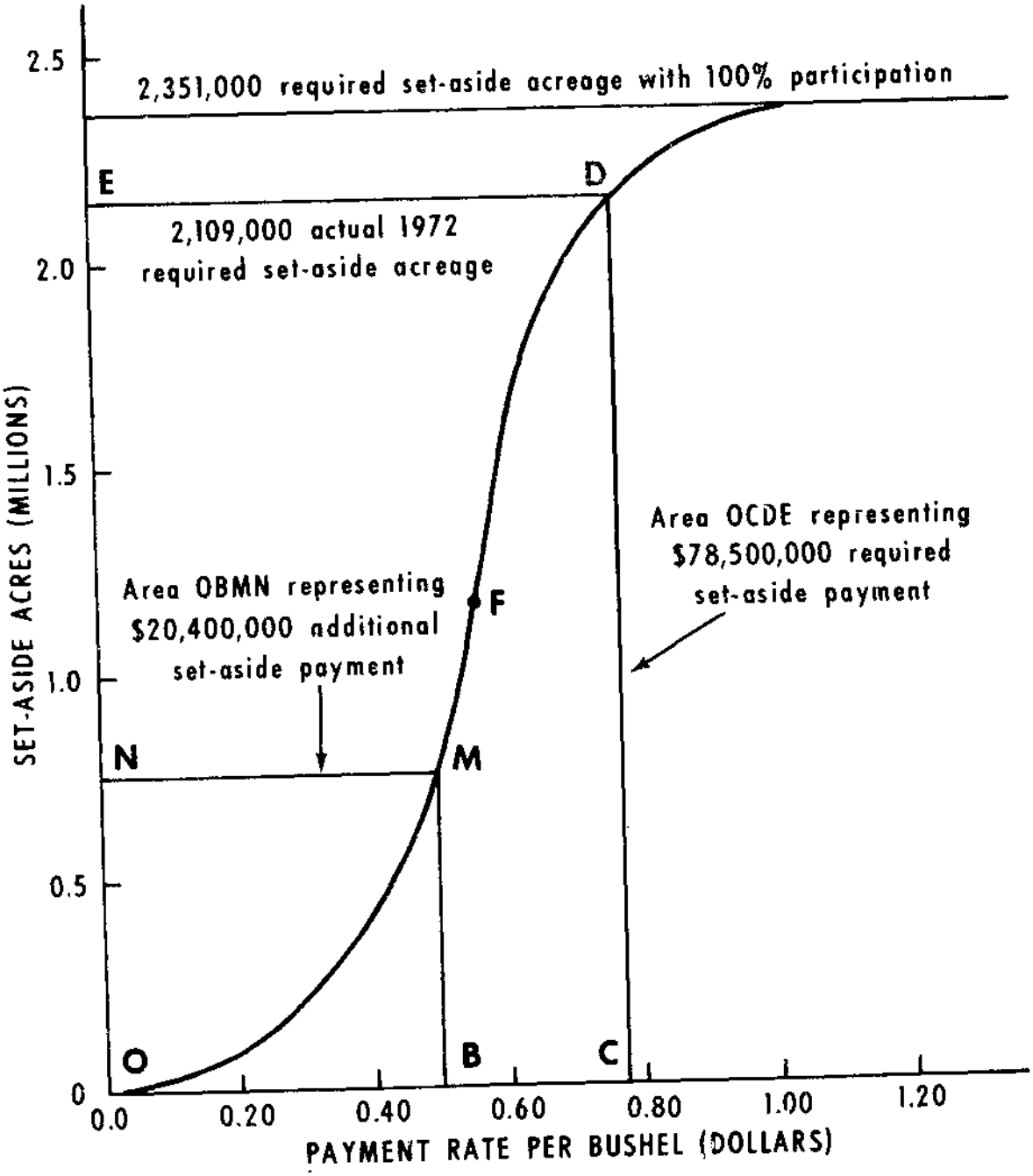

Figure 6

DISTRIBUTION OF EXPECTED NET RETURNS FOR COTTON IN THE SOUTH CENTRAL REGION, 1972

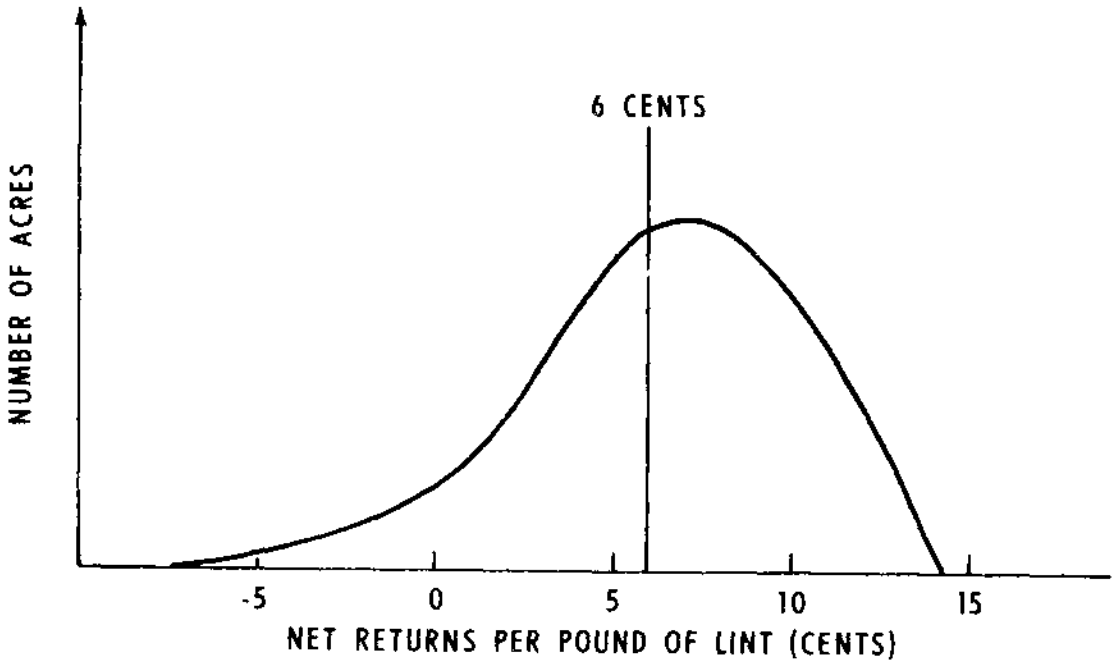

Figure 7

COTTON, FEED GRAIN, AND WHEAT ESTIMATES

Based on the theoretical model and procedure described above, similar income supplement estimates were made for all components of the 1972 set-aside program in all producing regions of the United States shown in figure 3. From these regional estimates, U.S. estimates shown in table 3 were computed as the weighted average of the regional results, using regional program payments as weights. In a similar manner, estimates for each crop were averaged. As shown in table 3, 51 percent of the 1972 required set-aside payment and 21 percent of the additional set-aside payment are estimated to be income supplement. Forty-six percent of the total 1972 program payment of $3,531 million is estimated to be income supplement.

Income supplement estimates for the cotton, feed grain, and wheat programs differ significantly (table 3). The cotton program has the highest income supplement with a U.S. average of 92 percent, the wheat program averages 48 percent, and the feed grain program is lowest with 25 percent. These different proportions result from differences in the structure of the three programs. The cotton program payment rate for set-aside averaged more than 10 times expected net returns from crop production, resulting in a very high income supplement. Required set-aside acreage for the wheat program is nearly equal to the payment acreage but the payment rate of $1.34 per bushel is much higher than expected net returns. Feed grain program payments are more in line with expected net returns and therefore a higher percent of the total payment is used for production adjustment than for income supplement.

Another characteristic of the feed grain and wheat programs is the higher income supplement proportions for payments made for required set-aside acreage compared with payments made for additional set-aside acreage. This difference arises from higher payment rates for the required set-aside options compared with the payment rates for the additional set-aside options. Given the general shape of the response curve shown in figure 6, high payment rates and the resulting participation

ESTIMATED RELATIONSHIP BETWEEN SET-ASIDE ACRES IN THE SOUTH CENTRAL REGION COTTON PROGRAM AND THE SET-ASIDE PAYMENT RATE, 1972

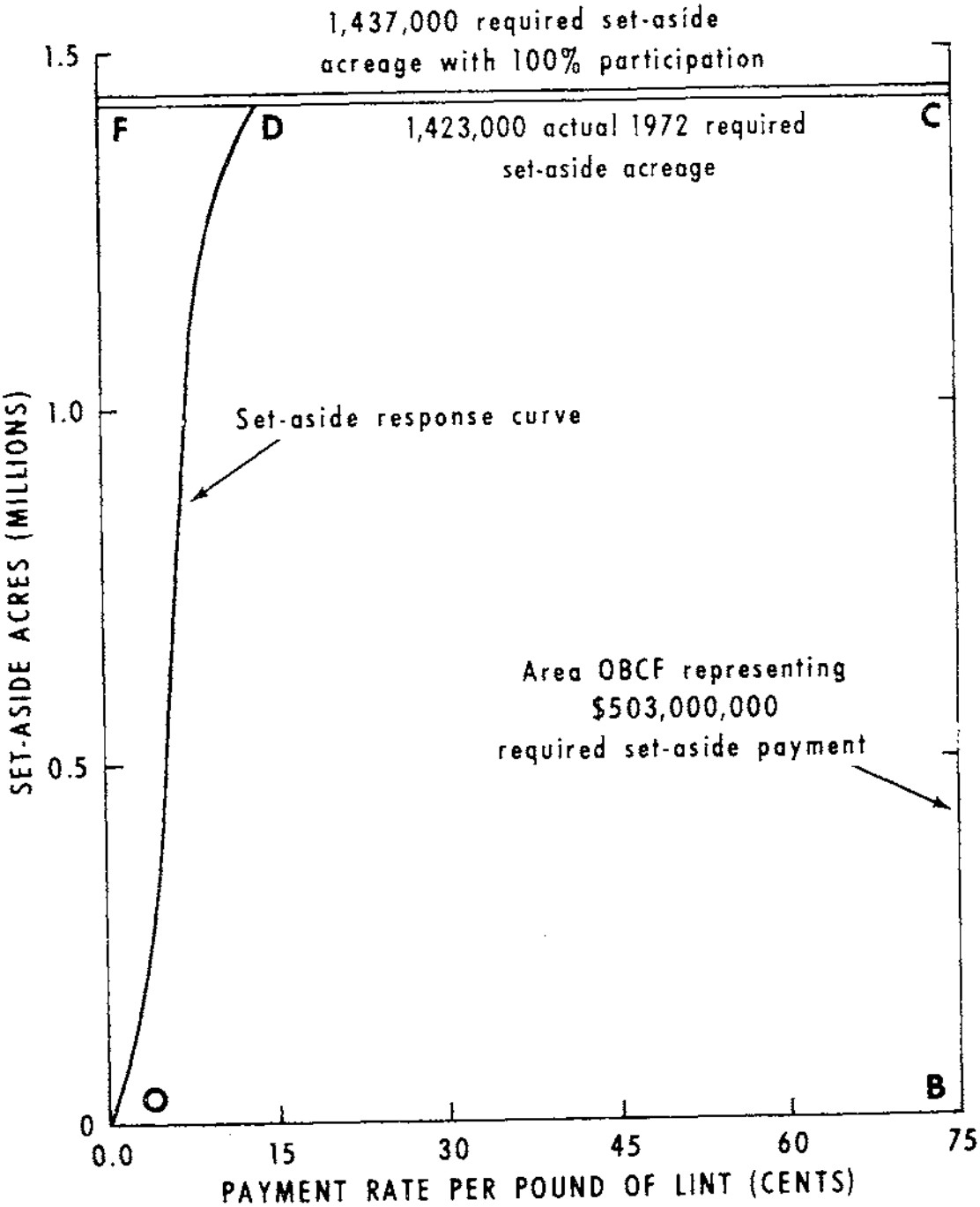

Figure 8

Table 3—Percentages of direct payments to farmers estimated as income supplement under the set-aside program, 1972

Item	Estimated income supplement
	Percent
Feed grain program:	
Corn:	
Required set-aside	23
Additional set-aside	19
Total	22
Grain sorghum:	
Required set-aside	42
Additional set-aside	20
Total	37
Barley:	
Required set-aside	41
Additional set-aside	22
Total	36
Required feed grain set-aside	27
Additional feed grain set-aside	19
Total	25
Wheat program:	
Required set-aside	52
Additional set-aside	28
Total	48
Cotton program:	
Required set-aside	92
Three programs:	
Required set-aside	51
Additional set-aside	21
Total	46

rates that approach 100 percent result in high income supplement proportions. Depending on the actual intent of the Agricultural Act of 1970, this result may offer some clues to possible revisions in the program structure to better achieve program goals. Higher payment rates along with low set-aside requirements and limits increase the income supplement proportion, as with the 1972 cotton program. Lower payment rates, along with higher allowable set-aside acreages, decrease the income supplement proportion. To be cost effective in terms of cost per acre retired, a production adjustment program would have to provide lower payment rates and allow participating farmers to set aside as much acreage as they want.

SPECIAL PROBLEMS ENCOUNTERED IN THE ANALYSIS

The limitations of this procedure and the problems encountered in making the regional estimates cannot be overlooked. Since this study represents the first results of a continuing research effort, it is appropriate to describe these limitations and problems in some detail as a background for further analysis. In some cases, significant improvement may be possible by using alternative procedures and by considering additional factors.

A basic limitation may be the definition of income supplement payments. The conceptual model of a

discriminating monopsonist provides a rigorous research procedure for estimating income supplement in this study. However, it may not be the concept that many policymakers have in mind when they consider the income supplement component of direct payments to farmers. In addition, the lack of a generally accepted definition complicates the problem. An advantage of the definition based on a discriminating monopsonist is that it identifies levels of production adjustment payments that could conceivably be achieved by a perfectly efficient voluntary land retirement program operated on a national bid basis.[12] However, it may be operationally impossible to design a program containing only production adjustment payments.

In the case of the cotton program, the production adjustment goal is complex, since the 1972 program required participating farmers to plant cotton as well as to set aside cropland to obtain the set-aside payment. Cotton program payments therefore served the three functions of (1) compensating for income foregone on idled land, (2) providing income supplement, and (3) inducing cotton production that would not have occurred otherwise. Many producers would not otherwise have planted cotton since their anticipated profits from cotton at market prices would have been less than anticipated revenues from alternative crops. Some producers would have anticipated net losses from producing cotton at market prices without the subsidy. For this study the cotton set-aside response curves reflect the additional payment required to compensate producers for income foregone on the idled land and for losses on the required cotton acreage. However, this study has ignored the additional payment that may be required to obtain cotton production in place of soybeans, feed grains, and wheat on farms where such crops are profitable. Possibly 1 or 2 percent of the cotton payment estimated as income supplement in this study should be attributed to the production incentive function.

Another limitation of the analysis is the assumption of economic rationality and the consideration of only economic factors in estimating the response curves. Because of nonconomic motivational factors, farmers may require payments to participate in voluntary diversion programs that differ considerably from their expected net returns. The assumptions used in this study represent quite naive approximations of actual farmer decisionmaking. More complex and realistic behavioral models would improve the procedure used.

[12] Zepp and Sharples, op. cit., p. 2.

Important economic factors may also have been ignored in a number of cases. For example, by maintaining the required set-aside acreage in the 1972 program, producers received two benefits. First, they received a payment for the set-aside acreage. Second, they received eligibility for a Commodity Credit Corporation (CCC) loan on their total production. It could be hypothesized that eligibility for the CCC loan and the additional income stability of the loan option would induce a significant number of producers to participate in the program even if there were little or no payment. Such participation has been ignored in this analysis. Consequently, the resulting income supplement estimates may be biased downward.

A further limitation of the analysis is the evaluation of a farmer's production adjustment on the basis of the expected net returns. This analysis assumes that participating farmers set aside acreage normally planted to the respective program crop (corn, sorghum, barley, wheat, or cotton) while many farmers actually set aside other crops with lower income. Therefore, a more realistic procedure would be to base the evaluation on the opportunity cost of the cropland and other resources idled by program participation. (Such opportunity cost is the highest economic return these resources could earn if they remain in production.) If we assume that all cropland on each farm is of equal quality and has a uniform opportunity cost or expected net returns, the two procedures provide identical results. However, to the extent that the cropland actually idled has lower expected net returns and the resources have low opportunity costs, the procedure followed by this study tends to underestimate the income supplement proportion.

Conceptually it is not difficult to estimate the opportunity costs of idled resources. However, difficulty arises in identifying exactly what crops to consider in estimating the opportunity costs of the set-aside acreage. Little information is available to identify the precise mix of crops that is reduced and what resources are idled for each acre set aside. For some farms it is a minor crop or marginal land. For others it is a major crop, such as corn, with high expected net returns. Still others must weigh the value of summer-fallowed land against the value of the crop produced the following year. Detailed consideration of this opportunity cost problem would greatly complicate the analysis.

Available ERS enterprise budget data are somewhat inadequate for this study. Note that the distribution of expected net returns in figure 4 is the distribution of budgets for all individual farms (or acres) in the region,

while ERS budgets represent averages for various aggregates of individual farms. Because the variance of actual data is always wider than the variance of the means of grouped data, the distribution shown in figure 4 is much wider than the distribution of the Great Plains ERS budgets. The ERS budgets are quite useful for determining the mean and provide some clues about the skewness of the distribution (or lack of it). They reveal little about the variance or width of the distribution, however.

Further research into the income supplement question should give increased attention to the problem of estimating the distribution of expected net returns and the opportunity costs of resources diverted. Basic data for all crops of the type currently collected in the ERS cotton cost survey are almost a necessity for this type of analysis.[13] A related problem involves estimating the expected return farmers have in mind when they make decisions concerning program participation. Farmers who expect high market prices are less likely to participate in the program than farmers with low price expectations. Additional research into price and yield expectations and the distribution of ASCS normal yields should therefore be considered as a basis for estimating the participation response curves more accurately.

[13] For example, see Starbird, I. R., and B. L. French. *1966 Supplement to Costs of Producing Upland Cotton in the United States, 1964.* U.S. Dept. Agr. 1966 Supplement to Agr. Econ. Rpt. No. 99, 42 pp., Sept. 1969.

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