Allocation of Net Farm Income

By Edgar B. Hurd

The problem of allocating farm income among the factors of production has long received the attention of agricultural economists. Progress toward a satisfactory solution has been impeded, both by difficult conceptual problems and by lack of adequate statistical data. In the following article, Mr. Hurd makes a new effort in the field of farm income allocation on the basis of a considerably better-than-average body of data, and a new conceptual approach. It is not expected that all readers will concur fully with his analysis. Problems are certain to be raised with respect to such questions as whether the value of inventory changes should be included in net farm income for allocation purposes; the inclusion of capital outlays in expenses deductible from gross income; and combining the return to labor and management. However, this paper does offer an approach to the problem that is both interesting and stimulating, and has the particular virtue of avoiding the unsatisfactory method of always treating the returns to one of the factors as a residual item.

THIS PAPER IS INTENDED to demonstrate various methods of allocating net farm income to unpaid factors of production. These factors of production include real estate (land and buildings), working capital (livestock, machinery, feeds, and seeds), and unpaid family and operator labor and management.

A satisfactory method of allocating net farm income has long been needed. How much of this income may be attributed to each of the unpaid factors? What are the rates of return per unit by factors? What is happening to these rates over time and how do rates in one area compare with rates in another area? How do the rates of return to factors of production used in agriculture compare with rates of return to factors of production used in other industries?

Even approximate answers to these questions would be helpful in (1) selecting an occupation, (2) management of individual farms, and (3) determination of agricultural policy. For answers to these and similar questions, a practical method of allocating net farm income is necessary. Some of the several methods suggested in this article have been used in past research in farm management. They are more or less standard. Other methods are new or new applications of old procedures and are therefore experimental.

Data used in this article came from a costs-and-returns study of average commercial family-operated wheat-pea farms of Washington and Idaho, made by the Production Economics Research Branch, Agricultural Research Service, United States Department of Agriculture in co-operation with the Washington and Idaho Agricultural Experiment Stations.[1] Data are available for each year from 1935 to 1955. The data and analyses are comparable from year to year and are adequate for the purposes outlined here. But, in order to apply the results obtained in that study, the definitions of the terms used should be understood.

Net farm income as defined in the present report is cash income exclusive of Government payments, plus the value of farm perquisites, and the value of the net change in inventories at year-end prices (table 1). Cash income is the difference between the total value of all farm products sold and cash expenditures. The latter consists of all cash paid during the calendar year for goods and services used in production, including cash paid for purchases of capital items such as machinery, equipment, service buildings, and fences.

Rent and interest payments and purchases of additional land are not included as costs. The farm share of the automobile is included. Included as costs are 50 percent of the automobile depreciation plus 50 percent of its operating costs involved in local travel. Taxes and repairs on real estate and working capital are included in cash expenditures. Government payments are usually included as a part of net farm income.

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[1] For a description of the wheat-pea area and for many details affecting net farm income, such as size of farm, farm organization, crop yields, mechanization, farm practices, and prices, see HURD, EDGAR B. WHEAT-PEA FARMING IN WASHINGTON AND IDAHO, 1935–53. U. S. Dept. Agr. Cir. 954. 1955.

They are excluded here because they are not related to factors of production in terms of quantity and price as are the other components of net farm income.

The value of farm perquisites includes the value of the farm garden, the value of livestock and livestock products consumed by the farm family at current prices, and the net rental value of the farm dwelling. The net rental value is estimated as 8 percent of the current value of the dwelling.

The value of the change in inventories is computed by multiplying the difference in physical terms between the beginning and closing inventories of specified crops, livestock, machinery and equipment, and service buildings at their respective year-end prices. By this method, capital gains or losses are excluded from net farm income.

TABLE 1.—*Net farm income, and factors that receive net farm income, wheat-pea area of Washington and Idaho, 1935–55*

Year	Net farm income [1]	Factors that receive net farm income		
		Labor and management time at work	Real estate area	Working capital, 1947–49 prices
	Dollars	Hours	Acres	Dollars
1935	2,288	2,156	389	9,005
1936	2,850	2,151	401	9,972
1937	2,618	2,117	397	11,703
1938	598	2,121	410	13,861
1939	1,643	2,094	421	15,461
1940	1,918	2,090	426	16,065
1941	4,794	2,063	427	17,293
1942	11,145	2,051	426	16,382
1943	11,377	2,041	440	19,285
1944	11,162	2,002	453	16,818
1945	9,611	2,002	444	17,891
1946	14,110	1,956	457	18,075
1947	15,257	1,977	476	19,282
1948	11,624	1,995	474	18,135
1949	8,330	1,987	494	19,791
1950	9,671	2,002	482	18,620
1951	10,536	1,981	498	19,623
1952	14,025	2,016	507	19,490
1953	14,520	2,230	512	21,016
1954	16,406	2,300	524	21,428
1955 [2]	10,281	2,300	536	22,516

[1] See text for definition.
[2] Preliminary.

Net farm income then is the income that results from the use of three sets of factors: (1) Labor and management of the operator and his family, (2) real estate (land and buildings), and (3) working capital (livestock, machinery, and crops held for feed and seed, and for sale). These factors are referred to as unpaid factors because, as defined, no charge is made for their use except the cost of maintaining the real estate and working capital.

Several approaches may be used in allocating net farm income to the factors of production. Each method has its advantages and its shortcomings. One approach is to assume that the return to family labor and management is the part of the net farm income that remains after the return to the current value of capital at the going rate of interest is deducted.

This assumption, however, is not realistic. Most farmland is only partially mortgaged and most working capital is owned free of debt. The landowner and the farm operator expect to recover investment costs with interest over a period of years, but they expect their returns to vary from year to year with the variation in net farm income. The latter varies greatly and is unpredictable.

Second approach is to assume that the return to capital is the part of the net farm income that remains after the return to the family for labor and management at hired labor rates is deducted. The difficulty with this approach lies in determining what the family labor and management services would command if offered for sale. The amount and effectiveness of many of these services vary greatly from farm to farm. Some of them have no alternative uses. Further, it is generally recognized that the returns actually realized from family labor and management vary from the market returns as measured by hired labor rates.

In corporation accounting, where all labor and management is hired, net income is attributed to capital. In most farm-management studies, net farm income is usually allocated to real estate and working capital on the basis of their current value times the going interest rate. The labor and management of the family is thus left as a residual claimant or, as stated above, the value of family labor and management at market prices is estimated and capital is left as the residual claimant.

The purpose of such accounts is chiefly to compare the efficiency in use of resources associated with different farming systems and practices on individual farms in areas where other production

conditions are reasonably similar. Somewhat different problems are involved in comparisons of incomes from a group of farms through time, or in comparing incomes in agriculture in one area with those in other industries or areas.

One approach to the problem of how to allocate net farm income, which is suggested for consideration here, is to assume that returns in a given year are shared by real estate, working capital, and family labor and management in proportion to their longer run or normal opportunity costs, or their contribution to net income. This would mean that (1) in a period in which resources used in agriculture earn returns comparable to returns in other industries, (2) or in a period when on the average there is no economic incentive to increase or decrease the size of the farm or to add or subtract working capital on the average farm, each factor earns a return equal to its opportunity costs. In prosperous years, each factor returns, in addition to its normal costs, a share of the profits. In depression periods, each factor shares the losses.

The purpose of this article is to present some empirical tests of the merits of these alternative methods of allocating net farm income to its component factors for a series of years in a simplified situation. In this way, some alternatives may be suggested for developing more adequate methods of procedure.

Measuring the Quantities of the Unpaid Factors

Measuring the quantity of each of the unpaid factors used on the farm in a given year is relatively easy. Real estate may be measured by the number of acres per farm. As this analysis deals with the average farm, it follows that the acres per farm are always of average quality.

The amount of family labor and management (the nonmaterial resources of the family) may be measured by the hours of family labor employed at farmwork. The size of the average farm family, its age, and its sex distribution have not changed materially in the last 25 years. Nor has the potential productivity of the human factor varied greatly from one year to the next.

The measurement of the physical quantities of working capital is more difficult because of (1) the diversity of the items that constitute working capital, and (2) the change over time in the relative composition of these items. A frequently cited example of the latter is the decrease in numbers of draft horses relative to the increase in numbers of tractors.

The problem of how to measure the quantity of working capital despite its changing composition may be resolved by using the 1947–49 average price per unit of each kind of working capital as a common denominator.[2] The amount of working capital was taken as the quantity in the January 1 inventory. Multiplying the quantity of each item of working capital in a given year by its respective average price during 1947–49 and summing these products give a physical measure of the working capital for that year. The only way in which this measure can change from one year to the next is by changing the quantities of capital items, as the common denominator 1947–49 price has been held constant.

After each unpaid factor has been measured in physical terms, the next step in the procedure is to obtain a common denominator or physical measure for acres of land, hours of labor, and dollars' worth of working capital. This common measure is called an input. The method of computing this measure is similar to that used in measuring the quantity of working capital at 1947–49 prices.

The average cost (1947–49) per physical unit of each factor is its ability to produce income. These average costs are based on alternative opportunities for producing income in the period 1947–49. For example, if loaned out at intermediate credit rates in the period 1947–49, capital earned 5.3 percent. Consequently, the input per $1.00 of working capital at 1947–49 prices is 0.053.

An acre of real estate on these wheat-pea farms was valued at $175 on 1947–49. If the farm owner had sold his land at this price and had invested his money in long-term real estate mortgages that were yielding 4.6 percent, he would have realized $8.05 per acre ($175 × .046). The input per acre of land is therefore 8.05.

The average wage paid by farmers per hour for labor without board or room during the period 1947–49 was $0.956. If, instead of farming for himself, the farm operator had worked at hired man's wages, he would have earned $0.956 per

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[2] These prices were used because they had been computed for another purpose. Probably a set of prices based on all years of record would be more appropriate here.

TABLE 2.—*Net farm income* [1] *and the composition of factors that share in net farm income*

| Year | Unpaid inputs [2] | Net farm income [1] | | Distribution of inputs | | | Total |
		Total	Per input [2]	Family labor	Real estate	Working capital	
	Number	*Dollars*	*Number*	*Percent*	*Percent*	*Percent*	*Percent*
1935	5,669	2,288	0.404	36	55	9	100
1936	5,813	2,850	.490	35	56	9	100
1937	5,840	2,618	.448	34	55	11	100
1938	6,063	598	.099	34	54	12	100
1939	6,210	1,643	.265	32	55	13	100
1940	6,278	1,918	.306	32	55	13	100
1941	6,326	4,794	.758	31	54	15	100
1942	6,258	11,145	1.781	31	55	14	100
1943	6,515	11,377	1.746	30	54	16	100
1944	6,452	11,162	1.730	30	56	14	100
1945	6,436	9,611	1.493	30	55	15	100
1946	6,507	14,110	2.168	29	56	15	100
1947	6,744	15,257	2.262	28	57	15	100
1948	6,684	11,624	1.739	29	57	14	100
1949	6,926	8,330	1.203	28	57	15	100
1950	6,781	9,671	1.426	28	57	15	100
1951	6,943	10,536	1.517	27	58	15	100
1952	7,041	14,025	1.992	27	58	15	100
1953	7,368	14,520	1.971	29	56	15	100
1954	7,553	16,406	2.172	29	56	15	100
1955 [3]	7,707	10,281	1.334	29	56	15	100

[1] Excludes Government Payments.
[2] Inputs that share in net farm income valued at 1947–49 average prices.
[3] Preliminary.

hour. The input for one hour of family labor and management is therefore 0.956.

Quantities of all the unpaid factors used in production from 1935 through 1955 have been summed into total inputs (table 2). This was done by multiplying the quantity of each factor shown in table 1 by its respective input per year. This procedure is illustrated for the year 1935 as follows:

| Factor | Quantity | Inputs in 1947–49 dollars | |
		Per unit	Total
	Hours	*Number*	*Number*
Family labor	2,156	0.956	2,061
	Acres		
Real estate	389	8.05	3,131
	Dollars		
Working Capital [1]	9,005	.053	477
Total			5,669

[1] Working capital based at 1947–49 dollars.

One input is $1.00 of cost at 1947–49 prices. One dollar at 1947–49 prices will buy 1.046 hours of labor (1.00÷0.956). It will buy the use for 1 year of 0.124 acre of land (1.00÷8.05). It will buy the use for 1 year of $18.87 worth of capital (1.00÷0.053). One input is therefore 1.046 hours of labor, 0.124 acre-years of land, or the use for 1 year of $18.87 worth of capital at 1947–49 prices.

Distribution of Inputs and Rate of Return per Input

Dividing the net farm income by the total inputs of the unpaid factors gives the rate of return per input. This rate multiplied by the total inputs supplied by each of the unpaid factors gives the allocated income to the total of each factor. This method of allocating net farm income is called "the imputed method" in this paper. By this method the income per unit of unpaid inputs varies by years, depending on the ratio of net farm income to total inputs. But the income per unit of input is the same for each of the unpaid factors in a given year.

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From 1935 to 1955, the inputs of the unpaid factors averaged $6,555 and net farm income averaged $6,581.[3] That is, each input received an income on the average of about $1.00. With minor exceptions, the trend in the number of inputs per year has been steadily upward at an average rate of 1.3 percent per year (fig. 1). The index of unpaid inputs (1935–55=100) was 86.5 in 1935 and 117.6 in 1955. The index of net farm income (1935–55=100) varied from a low of 10 in 1938 to a high of 217 in 1954. From 1935 to 1955, the average variation in net farm income amounted to 117 percent. This contrasts with a variation in unpaid inputs of 7 percent.

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[3] Computed on the basis of the geometric mean.

It is evident, therefore, that most of the variation in net farm income is reflected in the variation of returns per unit of unpaid factor. This is particularly true in the short run and it is true to a large extent for a 25-year period.

Rate of growth in size of farm as measured by the number of unpaid inputs is approximately proportional to the increase in number of acres per farm. Between 1935 and 1955, real estate accounted for slightly more than 55 percent of all nonpaid inputs. The growth in size of the average family-operated farm is relatively small from year to year. But over the years the increase is significant.

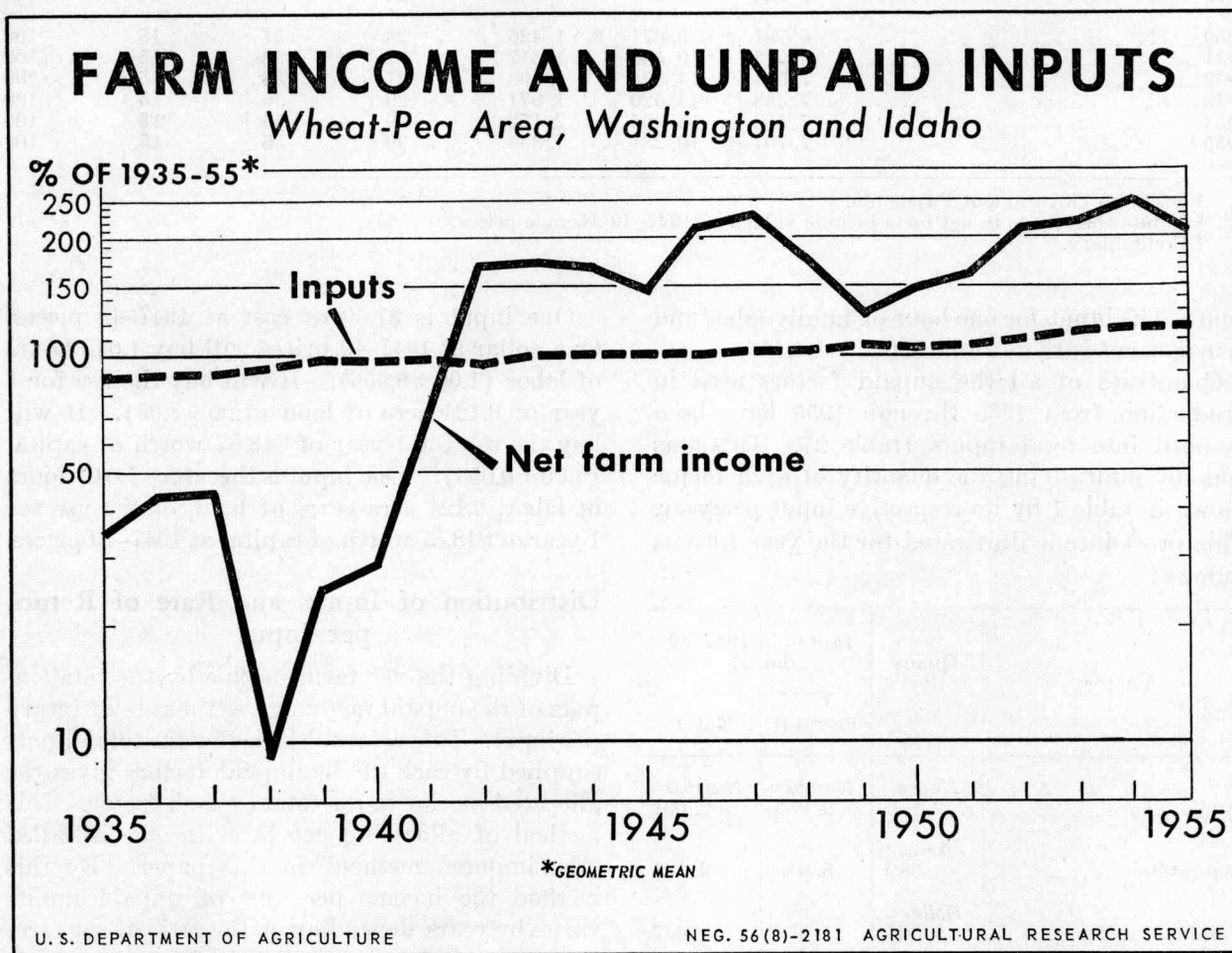The average family operated a 38-percent larger farm in 1955 than in 1935. This growth was

FIGURE 1.

TABLE 3.—*Real estate and its income, wheat-pea area of Washington and Idaho, 1935–55*

Year	Area per farm	Value per acre	Total value per farm	Interest rate	Returns per acre based on—			Total farm returns based on—		
					Interest	Share rent	Imputed rate	Interest	Share rent	Imputed rate
	Acres	Dollars	Dollars	Percent	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1935	389	57	22, 173	5. 7	3. 25	2. 69	3. 25	1, 264	1, 048	1, 265
1936	401	57	22, 805	5. 2	2. 96	3. 29	3. 95	1, 186	1, 321	1, 582
1937	397	65	25, 976	5. 1	3. 34	3. 37	3. 61	1, 325	1, 339	1, 432
1938	410	66	27, 126	4. 9	3. 24	1. 78	. 80	1, 329	729	327
1939	421	62	26, 228	4. 8	2. 99	2. 33	2. 13	1, 259	982	898
1940	426	68	29, 057	4. 7	3. 21	2. 68	2. 46	1, 366	1, 141	1. 049
1941	427	68	29, 074	4. 6	3. 13	4. 58	6. 10	1, 337	1, 955	2, 605
1942	426	74	31, 686	4. 6	3. 42	8. 69	14. 34	1, 458	3, 704	6, 107
1943	440	86	37, 946	4. 4	3. 80	9. 10	14. 06	1, 670	4, 006	6, 184
1944	453	101	45, 912	4. 4	4. 46	9. 41	13. 93	2, 020	4, 262	6, 309
1945	444	115	51, 162	4. 6	5. 30	8. 69	12. 02	2, 353	3, 857	5, 336
1946	457	135	61, 530	4. 7	6. 33	11. 19	17. 45	2, 892	5, 114	7, 976
1947	476	159	75, 544	4. 6	7. 30	12. 16	18. 21	3, 475	5, 788	8, 668
1948	474	180	85, 202	4. 6	8. 27	9. 68	14. 00	3, 919	4, 586	6, 636
1949	494	186	91, 738	4. 6	8. 54	7. 27	9. 68	4, 220	3, 593	4, 784
1950	482	186	89, 759	4. 6	8. 57	8. 57	11. 48	4, 129	4, 129	5, 533
1951	498	214	106, 576	4. 6	9. 84	9. 68	12. 21	4, 902	4, 820	6, 092
1952	507	224	113, 568	4. 6	10. 30	12. 51	16. 03	5, 224	6, 343	8, 129
1953	512	216	110, 592	4. 6	9. 94	12. 04	15. 87	5, 087	6, 163	8, 124
1954	524	221	115, 848	4. 6	10. 17	12. 44	17. 48	5, 329	7, 073	9, 161
1955 [1]	536	227	121, 763	4. 8	10. 90	9. 27	10. 74	5, 845	4, 970	5, 756

[1] Preliminary

made possible chiefly by an increase in working capital. In 1935, working capital accounted for 477 unpaid inputs, or 9 percent of the total. In 1955, it accounted for 1,193 inputs, or 15 percent of the total.

As the size of farm has increased with additional acres and more working capital, family labor has of necessity supplied proportionately less of the total inputs. In 1935, family labor supplied 4 times as many inputs as working capital, whereas in 1955 it supplied only twice as many.

Return to Real Estate

The return to real estate has been estimated on three different bases: (1) Estiamted total value of real estate times the current interest rate on farm mortgages; (2) customary share rent; and (3) imputed rate (table 3).

Estimated values of real estate as used here are based on average prices paid for land in the area. These sales reflect the judgment of landlords and farmers as to what they think their land is worth. In making their appraisals, consideration is given to current and prospective income. About 3 percent of the farmland changes ownership each year as a result of voluntary sale. The owners of the other 97 percent probably consider that, to them, farmland is worth more than the going market price.

For most of the years 1938 through 1955, it is clear that the current market price of land was undervalued relative to the succeeding year's price. This was particularly true from 1942 through 1948 when the market price each year was from 13 to 17 percent higher than in the previous year. Economic instability, characterized by the period 1935–55, makes it difficult to determine what land is actually worth. It is obvious that the market price of farmland cannot reflect accurately the year-to-year changes in net farm income.

Interest rates on farm mortgages in the area declined from 5.7 percent in 1935 to 4.4 percent in 1943. Thereafter, they remained at about 4.6 percent until 1955, when they averaged about 4.8 percent. There appears to be little relationship in the short run between the interest rate on mortgages and the income from land.

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Share rent probably comes closer to reflecting the annual contribution of land to net income than the estimated market value of real estate times the mortgage interest rate.

The share rent shown in table 3 is the value of the landlord's share of the crops at market price less his expenditures for buildings, fences, and real estate taxes. The landlord usually received a third of the grain and a fourth of the hay and peas. The return to land based on share rent fluctuates more from year to year than does the return to land based on interest because crop yields and prices of farm products are highly variable.

These fluctuations tend to be in the same direction as fluctuations in net income. But we have some empirical evidence to indicate that the fluctuations in share rent given in table 3 do not show the full variation in the contribution of land to net income. In years of low net income, net share rent is probably higher than the contribution of land to earnings; in years of high net income, it probably is less than the contribution of land. From area to area, share rents tend to increase as the productivity of land increases. In a given area, share rent is established as a normal or general average and remain inflexible from year to year.

Beginning with 1941, incomes in the Palouse area have been relatively good. This is reflected in the increasing *value* of share rents and also in returns based on interest charges. These increases, however, probably do not fully reflect the increased contribution of land to net income since 1941. There have been some reports of increases in the share paid as rent.

The current difficulties of farmers in acquiring additional land to rent support the belief that the share paid as rent is increasing. But the rental market for land is far from perfect in an economic sense. Many farmers have rented at least parts of their farms for a generation.

So long as the returns to the landlord increase and prospective land values and prices of farm products improve, landlords are usually satisfied with existing rental terms. In these circumstances, tenants also are reasonably satisfied with their leases. Consequently, relatively few farms are available for leasing to new tenants. Of late years, tenants who have wanted to stop farming have been able to dissolve their leases and sell their farm equipment on favorable terms.

In general, the imputed rate of return to land is above or below the rate determined by share rent, depending on whether the rate based on share rent is above or below that determined on the basis of the market value times the interest rate.

Return to Working Capital

The return to working capital was estimated on two different bases: (1) The estimated value of working capital times the going rate of interest, and (2) the imputed basis (table 4).

The quantity of working capital was valued each year on two different bases: (1) At current prices and (2) at 1947–49 prices. Multiplying the valuation based on current annual prices by the interest rate on short-time loans gives the annual returns based on interest.

Dividing the imputed return to working capital by the actual value of the capital gives the imputed rate on the actual value. For the year 1935, the imputed return was $193; the actual value of the capital was $3,934; and the imputed rate on the actual value was 4.9 percent.

For the years 1935 through 1940, the imputed rate was substantially less than the interest rate. In view of the fact that capital increased rapidly during this period, the productivity of capital may have been considerably greater than was indicated on the basis of relative costs at 1947–49 rates. Part of this was due to the change in relative costs from the decade of the 1930's to the decade of the 1940's. From 1935–39 to 1947–49, wage rates for hired labor rose more than twice as much as costs of capital. If the 1935–39 period had been used to establish the rates of factor inputs, a considerably larger sum would have been allocated to capital.

After 1940, interest rates declined and net farm income increased. In general, if capital earns much more than the interest charges, farmers tend to buy more capital items. In accordance with this tendency, the number of items of machinery and power bought by farmers in the 1940's increased greatly. The rate of purchase was held down by farmers' inability to obtain all the machinery they wanted because of wartime restrictions, or by their inability to expand their farm acreages. The greatest dispersion between the interest rate and the imputed rate was in 1946. Since 1946 the margin between the two rates has narrowed.

TABLE 4.—*Working capital and its earnings, wheat-pea area of Washington and Idaho 1935–55*

Year	Valuation of working capital		Rate of return on actual value		Annual return	
	1947–49 valuation	Actual value	Interest rate	Imputed rate	Based on interest	Imputed
	Dollars	*Dollars*	*Percent*	*Percent*	*Dollars*	*Dollars*
1935	9,005	3,934	6.5	4.9	256	193
1936	9,972	4,564	6.4	5.7	292	259
1937	11,703	5,859	6.4	4.7	375	278
1938	13,861	6,554	6.4	1.1	419	73
1939	15,461	6,211	6.5	3.5	404	217
1940	16,065	6,912	6.5	3.8	449	260
1941	17,293	7,442	6.0	9.3	447	695
1942	16,382	8,972	5.8	17.2	520	1,546
1943	19,285	12,732	5.8	14.0	738	1,784
1944	16,818	12,222	5.7	12.6	697	1,541
1945	17,891	13,379	5.4	10.6	722	1,415
1946	18,075	13,668	5.2	15.2	711	2,077
1947	19,282	16,659	5.2	13.9	866	2,312
1948	18,135	20,085	5.2	8.3	1,044	1,671
1949	19,791	20,611	5.3	6.1	1,092	1,262
1950	18,620	17,847	5.4	7.9	964	1,407
1951	19,623	20,742	5.5	7.6	1,141	1,578
1952	19,490	23,001	5.6	8.9	1,288	2,058
1953	21,016	24,398	5.7	9.0	1,391	2,196
1954	21,428	23,871	5.7	10.3	1,361	2,467
1955	22,516	24,746	5.7	6.4	1,411	1,591

Return to Family Labor (Exclusive of Government Payments)

Returns per hour to family labor were estimated by four methods: (1) By valuing family and operator labor at wage rates paid to hired labor without board; (2) by imputation; (3) by assuming a return to the farm operator and family equal to that of a share renter; and (4) by assuming that family labor is a residual claimant after all other charges and allowances are paid (table 5).

The imputed method has been explained and the hired-labor basis is self-explanatory. The return based on share rent starts with net farm income, from which is deducted the value of the net share rent and the value of working capital at current interest rates. The method of determining share rent was explained in the real estate section. The current interest rate is based on short-term or intermediate credit loans. The residual method is the one usually adopted by most farm-management studies. This method deducts from net farm income the interest on working capital and the interest on real estate values at current prices.

The variation in the hired labor rate reflects general price movements. The variation in the rate based on imputation reflects the variation in net farm income. The variation in the rate based on share rent magnifies the variation in net farm income. The variation in the rate based on the residual method magnifies even more the variation in net farm income. In times when incomes are unfavorable, the rates are in this order starting from the lowest: (1) Residual; (2) share rent; (3) imputed; and (4) hired labor (fig. 2). In good times, this order is reversed.

Summary and Conclusion

The method by which net farm income is allocated to the unpaid factors of production should depend upon (1) the purpose for which the allocation is designed and (2) the effectiveness with which the method accomplishes this purpose. This paper presents an imputation method of allocating net farm income as an alternative to the more usual market-price method.

The market-price method assumes that each factor earns a return equal to the price it could

demand in the market. This method was used in showing the returns to labor at wage rates for hired hands, returns to working capital at market value times short-time interest rates, and returns to real estate at market value times interest rates on longtime mortgages. The market-price method allocates all net farm income to the unpaid factors of production only when prices equate their marginal productivities.

In most years since 1935, the sum of the returns to operators of wheat-pea farms in Washington and Idaho based on market prices has not equaled net farm income. For some years, the difference between net farm income and the sum of the value of all inputs at market prices is greater than net income itself.

The failure of market prices to equate net farm income is frequently resolved by using market prices for two of the factors, usually land and working capital, and allowing the residual to go to the other factor, usually labor. This is the so-called labor-income method. It was illustrated as the residual method for (1) the owner operator and (2) the share renter.

The residual method for the owner operator would be analogous to a tenant paying cash rent for all his capital on the basis of its value times the current rate of interest on farm mortgages. Few if any farmers are in this category, as landlords do not operate on this basis. The residual method may be a useful tool to an owner operator in learning whether he would be financially better off had he sold out, invested his capital at the going interest rate, and worked at some other occupation. An individual farmer can always sell his farm at the market price. However, this is not true of all farmers in the aggregate. For this reason, the residual method is not suitable for aggregative analysis.

In a period of disequilibrium the distortion in market prices is amplified in returns to family labor when these returns are computed by the residual method. For this reason, the residual method is poorly adapted to evaluation of the contribution of the unpaid factors to net income. This is particularly true in a time series for all farms in a given area.

TABLE 5.—*Estimated income to family labor exclusive of government payments, wheat-pea area of Washington and Idaho, 1935–55*

Year	Family labor	Income per hour estimated by various methods				Annual income estimated by various methods			
		Hired	Imputed	Share rent	Residual	Hired	Imputed	Share rent	Residual
	Hours	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1935	2156	0.221	0.386	0.456	0.356	476	833	984	768
1936	2151	.271	.469	.575	.638	583	1,008	1,237	1,372
1937	2117	.285	.428	.427	.434	603	907	904	918
1938	2121	.278	.094	−.259	−.542	590	200	−550	−1,150
1939	2094	.274	.253	.123	−.010	574	530	257	−20
1940	2090	.292	.292	.157	.049	610	611	328	103
1941	2063	.347	.725	1.161	1.459	716	1,495	2,395	3,010
1942	2051	.499	1.703	3.374	4.470	1,023	3,492	6,921	9,167
1943	2041	.728	1.669	3.250	4.394	1,486	3,407	6,633	8,969
1944	2002	.819	1.653	3.098	4.218	1,640	3,311	6,203	8,445
1945	2002	.853	1.428	2.513	3.265	1,708	2,858	5,032	6,536
1946	1956	.878	2.073	4.236	5.340	1,717	4,054	8,285	10,446
1947	1977	.911	2.162	4.352	5.445	1,801	4,275	8,603	10,765
1948	1995	1.080	1.662	3.005	3.253	2,155	3,316	5,994	6,490
1949	1987	.876	1.150	1.834	1.473	1,741	2,285	3,645	2,926
1950	2002	.875	1.363	2.287	2.197	1,752	2,729	4,578	4,399
1951	1981	1.096	1.450	2.309	2.160	2,171	2,873	4,575	4,279
1952	2016	1.269	1.904	3.172	3.625	2,558	3,838	6,394	7,309
1953	2230	1.265	1.884	3.124	3.606	2,821	4,202	6,966	8,042
1954	2300	1.252	2.077	3.496	4.224	2,880	4,776	8,040	9,716
1955 [1]	2300	1.290	1.275	1.726	1.315	2,967	2,933	3,969	3,025

[1] Preliminary.

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FARM FAMILY LABOR RETURN

Wheat-Pea Area, Washington and Idaho

$ PER HR.

Residual

Share rent

Imputed

Wage rate

1935   1940   1945   1950   1955
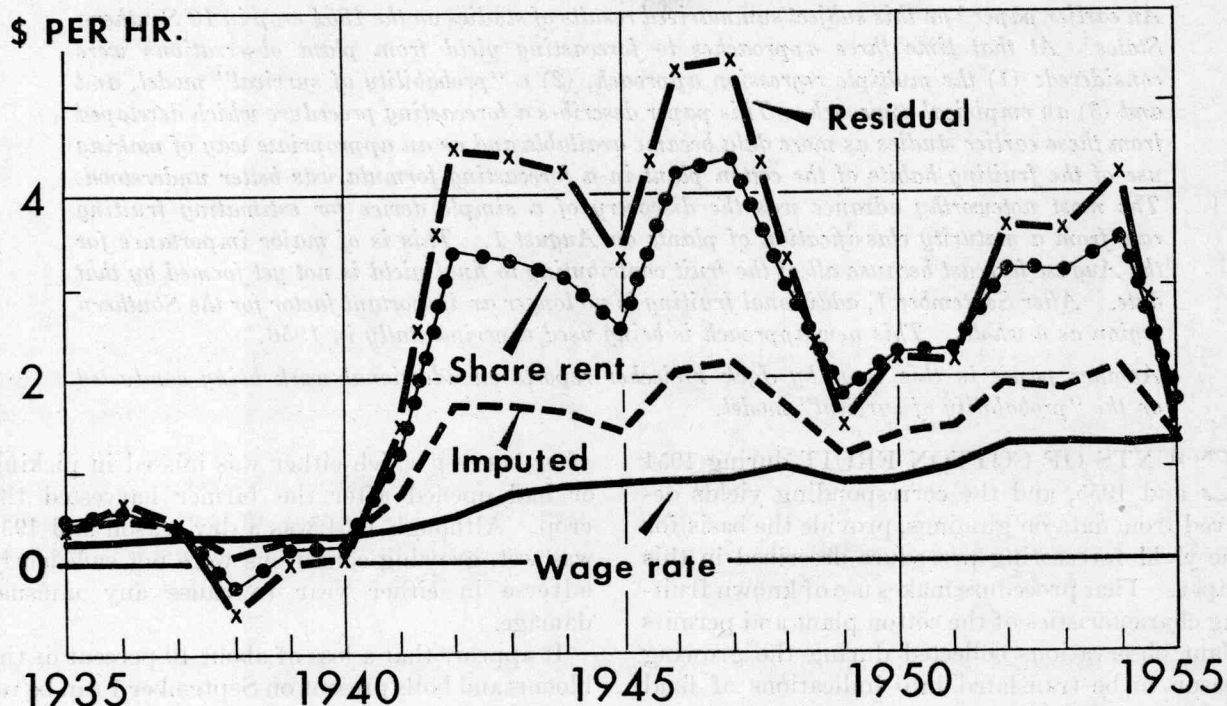
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FIGURE 2.

Like the residual method, the imputed method allocates all the income. It assumes that each unpaid factor of production shares in the net farm income in proportion to the amount each would earn at market prices during a normal period. This assumes that the farm is in equilibrium from the standpoint of relative prices for the factors and their productivities, and that the value of these factors in any year would be this cost plus a pro rata share of the profits. Yearly incomes to these resources on these assumptions would be in the nature of rent and hence income should be allocated on the basis of normal shares.

The imputation method gives a more exact approximation of the level of income, at least during the last 10 to 15 years, when relative prices of resource services approximated their 1947–49 relationship.

The method, however, fails to explain fully why the proportions among the resources change. For example, in terms of the 1947–49 price level, wheat-pea farmers had about 2.4 times as much working capital in 1954 per hour of family labor as they had in 1935. This suggests that the relative marginal productivity of labor and capital in the two periods may not have been the same. As a consequence, the imputation method may not correctly allocate the net farm income.

Neither of these methods measures precisely the contribution of each of the unpaid factors to net farm income. This analysis indicates that the imputed method has some advantages over the more conventional methods. The imputed method requires careful selection of base rates for good results. These rates should be revised as economic and technical conditions change.

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