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FARM BUSINESS SECTOR  
IN THE  
NATIONAL FLOW OF FUNDS ACCOUNTS

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Agricultural economists have occasionally undertaken a fundamental examination of agricultural capital and credit flows, with Tostlebe [8], Johnson [4], and Melichar and Doll [5] completing major studies during the past two decades. Each of these studies measured farm capital formation, ascertained how it was financed in different periods, and then attempted to explain trends and changes found in the manner of financing. The use of flow data provided insights into historical and current phenomena and appeared useful in anticipating future trends.

Also during the past two decades, the national Flow of Funds Accounts were developed at the Federal Reserve Board (FRB). These accounts include a Farm Business Sector that shows farm investment and financial flows on an annual and quarterly basis. Irwin, Lins, and Penson have recently written about this account, purportedly to introduce it to agricultural economists and to discuss its uses, deficiencies, and desirable extensions [3, 7].

As judged from their articles, however, the latter investigators have not recognized the essential similarity between the data and framework of the FRB Farm Business Sector account and those employed in the major studies cited above. Consequently, they miss seeing the role that flow of funds accounts have already played in a major stream of research into aggregate relationships in agricultural finance. They miss the vital questions for which flow of funds data have already proved essential--questions about the relative burden that capital spending places on income flows, and about how the financing of that burden is distributed between saving and borrowing. This article seeks to remedy their oversights.

To understand and appreciate the contribution of flow of funds accounting to description

and analysis of aggregate farm financial relationships, it is well to begin by examining Tostlebe's pioneering work, followed by a brief look at Johnson's updating of it. The FRB Farm Business Sector account is then readily seen as providing the same type of data currently. The article concludes by examining and updating the more recent study by Melichar and Doll, which employed flow data easily derived from U.S. Department of Agriculture (USDA) series rather than from the FRB account and which remedied, at least approximately, the most serious omission noted in the Tostlebe-Johnson studies and in the FRB data.

### Study I: Tostlebe

In the early 1950's Alvin S. Tostlebe, with support from the National Bureau of Economic Research, undertook "to measure and analyze the growth of farm capital over the eighty-year span from 1870 to 1950, to analyze...the financing that accompanied it, and to extract from this historical survey suggestions as to prospective future trends in capital formation and financing in agriculture" [8, p. 3].

In his work on flows, Tostlebe first defined farm capital formation and estimated each component, as shown in Table 1a. Then he looked into the financing of this capital flow and came up with the sources of funds statement shown in Table 1b. The reasoning employed there is a key concept in flow of funds accounts for the farm sector. First, in any period the total funds raised to finance capital formation had to be equal to the amount of that capital formation; in other words, total sources of funds are set equal to the total uses of funds that have already been directly measured or estimated. Second, the funds obtained in that period through an increase in borrowing are directly measured or estimated.

### References

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- (4) Johnson, D. Gale, "Agricultural Credit, Capital and Credit Policy in the United States," Federal Credit Programs, Commission on Money and Credit, CED, Prentice-Hall, 1963, pp. 355-423.
- (5) Melichar, Emanuel, and Doll, Raymond J., Capital and Credit Requirements of Agriculture, and Proposals to Increase Availability of Bank Credit, Board of Governors of the Federal Reserve System, 1969.
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- (8) Tostlebe, Alvin S., Capital in Agriculture: Its Formation and Financing since 1870, National Bureau of Economic Research, Princeton University Press, 1957.

Table 1. Uses and Sources of New Capital in Farming, by Five-Year Periods, 1900-1949, as Estimated by Tostlebe (Annual average, millions of dollars)

Item	1900-1904	1905-1909	1910-1914	1915-1919	1920-1924	1925-1929	1930-1934	1935-1939	1940-1944	1945-1949
<b>la. Uses of funds</b>										
To maintain, increase, or improve:										
Land and buildings.....	480	600	760	860	420	880	440	420	80	1,580
Machinery and motor vehicles...	280	360	460	660	620	700	320	680	1,000	1,160
To increase inventories:										
Livestock.....	40	0	100	40	-140	-80	-40	0	60	-380
Stored crops.....	20	0	60	20	-60	-20	-220	220	120	80
To increase financial assets:										
Cash working balances.....	40	40	20	280	-60	-40	-20	140	580	480
Financial reserves.....	40	60	60	700	-300	60	-100	240	1,580	660
Total uses.....	900	1,060	1,460	2,560	480	1,500	380	1,700	4,140	4,580
<b>lb. Sources of funds</b>										
Increase in debt.....	240	300	520	1,420	160	120	-520	120	-400	600
From cash flow.....	660*	760*	940*	1,140*	320*	1,380*	900*	1,580*	4,540*	3,980*
Total sources.....	900	1,060	1,460	2,560	480	1,500	380	1,700	4,140	4,580
<b>lc. Sources of funds</b>										
Increase in debt.....	240	300	520	1,420	160	120	-520	120	-400	600
From cash flow:										
Capital consumption allowances.	440	600	740	1,060	1,400	1,240	960	980	1,460	2,660
From net income.....	220*	160*	200*	80*	-1,080*	140*	-60*	600*	3,080*	1,320*
Total sources.....	900	1,060	1,460	2,560	480	1,500	380	1,700	4,140	4,580

Source: Tostlebe, Alvin S., Capital in Agriculture: Its Formation and Financing Since 1870, National Bureau of Economic Research (Princeton University Press), 1957, pp. 137-139.

Third, the increase in debt is subtracted from the total sources of funds to obtain the estimate of funds provided internally. (In Tables 1 through 4, data that are obtained in the latter fashion, as a residual quantity, are marked by an asterisk [\*].)

After setting up these accounts, Tostlebe was able to make some significant analytical observations and comparisons. First, he found that "capital formation and income have maintained a surprisingly consistent relation to each other. Except for the period 1920-35, in which farming twice suffered severe depression, ... gross capital formation amounted to around one-fifth of income net of production expenses except depreciation" [p. 149]. (Such income is herein referred to as "cash flow.")

Second, from Table lb, Tostlebe concluded that "to a remarkable degree, farmers have financed the increase in farm capital with their own incomes and savings. ... in every decade... save the one immediately preceding 1920, farmers supplied by far the greater part of the funds that financed the capital acquisitions" [p. 19].

Third, Tostlebe thought it revealing to compare the amount of farmers' own contributions toward financing of capital formation to the amount of the presumed source of these funds--cash flow--and to observe this relation over time [p. 144]. He found a giant cyclical swing that took the ratio from a level of 16 per cent in 1900-14 to a low of 4 per cent in 1920-24, then gradually up to a peak of 35 per cent in 1940-44 before beginning another decline that had reached 19 per cent by 1945-49 [p. 146]. These data on farmers' savings rates add an enlightening dimension to study of changes in farmers' borrowings, which too often is limited to considerations of investment demand and the availability of credit.

Finally, Tostlebe also employed a slightly different analytical approach based on the assumption that all funds received by farmers as capital consumption allowances were allocated to financing of new capital spending. To reflect this view of farmers' behavior, Tostlebe constructed the account shown in Table lc. He estimated the amount of capital consumption allowances and subtracted both these and the increase

in debt from the total capital formation, obtaining a residual presumed to be financed from net income. In the two periods of farm depression, this residual is negative; thereby showing that funds obtained through borrowing and capital consumption allowances were more than sufficient to finance such capital formation as took place. Some funds so obtained--the amount being shown by the negative values--were diverted to uses other than the capital formation items listed in Table 1a--perhaps to "facilitating transfers of established farms" [p. 140]. This omission of a potentially important use of funds became a matter of greater concern to later investigators.

Study II: Johnson

Around 1960, the Commission on Money and Credit sponsored by the Committee for Economic Development asked D. Gale Johnson to make a study of Federal farm credit policies. As background material, Johnson used Tostlebe's data and also

Table 2. Uses and Sources of New Capital in Farming, by Selected Periods, 1945-1958, as Estimated by Johnson (Annual average, millions of dollars)

Item	1945-1949	1950-1954	1955-1958
<u>2a. Uses of funds</u>			
To maintain, increase, or improve:			
Land and buildings.....	1,160	1,740	1,260
Machinery and motor vehicles....	1,980	2,900	2,040
To increase inventories:			
Livestock.....	- 340	140	0
Stored crops.....	0	220	500
To increase financial assets:			
Cash working balances.....	340	60	120
Financial reserves.....	560	220	180
Total uses.....	3,700	5,280	4,100
<u>2b. Sources of funds</u>			
Increase in debt.....	840	860	1,100
From cash flow.....	2,860*	4,420*	3,000*
Total sources.....	3,700	5,280	4,100
<u>2c. Sources of funds</u>			
Increase in debt.....	840	860	1,100
From cash flow:			
Capital consumption allowances..	1,740	3,300	3,060
From net income.....	1,140*	1,120*	- 60*
Total sources.....	3,700	5,280	4,100

Source: Johnson, D. Gale, "Agricultural Credit, Capital and Credit Policy in the United States," Federal Credit Programs, Commission on Money and Credit, Committee for Economic Development (Prentice-Hall), 1963, pp. 378-379.

found that for the more recent years he could derive a similar account from annual data that the USDA was by then publishing in The Balance Sheet of Agriculture and The Farm Income Situation. Johnson's accounts for 1945-1958 are shown in Table 2. In spite of some differences, these data served to extend Tostlebe's analytical approach to the new decade.

Johnson was impressed, as Tostlebe had been, with the proportion of capital that had been financed internally rather than by increasing debt [4, p. 377]. But he restricted his analytical comments to the distribution of financing between debt and savings and did not go on to compare savings with income, as Tostlebe had found rewarding.

Johnson found that in his most recent period, 1955-58, debt financing rose in spite of a drop in capital formation, so that capital consumption allowances and the increase in debt together exceeded capital formation. This seemed unusual, as in the first half of the century Tostlebe had found this situation only in periods of farm depression. It is now evident that Johnson's data for 1955-58 were reflecting an ongoing major change in farmers' financial behavior, toward a lower savings rate and more use of credit, but Johnson made his study a little too early to draw this conclusion firmly.

But partly because of his results for 1955-58, Johnson did worry that capital flows involved in transfers of farms were omitted, while debt incurred in these transfers was included. Given this inconsistency, Johnson cautioned that "it hardly seems reasonable to assume that net income made no contribution to net investment during the period 1954-58" [p. 377]. This intuitive conclusion was later confirmed by Melichar and Doll.

Farm Business Sector,  
National Flow of Funds Accounts

With this background, one can profitably examine the FRB Farm Business Sector account, which extends back to 1946 as shown in Table 3.

Table 3a shows the uses of funds. Capital expenditures are defined in about the same way as Johnson did, as both use USDA data. However, financial reserves are omitted on the grounds that farmers maintain most of these for family purposes or as savings (as do nonfarm families) rather than as part of current farm business operations. But included are the increases in capital stock in the Farm Credit System and in nonlife insurance prepayments and claims, the latter a use of funds not found in Johnson's accounts or in the USDA's Balance Sheet.

Table 3. Saving, Investment, and Financial Flows, Farm Business Sector, by Selected Periods, 1946-1969  
(Millions of dollars)

Item	Annual average					Annual				
	1946-1949	1950-1954	1955-1959	1960-1964	1965-1969	1965	1966	1967	1968	1969
<b>3a. Uses of funds</b>										
Gross capital expenditures:										
Residential construction.....	727	763	649	585	551	521	541	569	549	574
Plant and equipment.....	2,826	3,587	3,426	3,928	5,450	4,850	5,421	6,011	5,463	5,503
To increase inventories of live-stock and stored crops.....	-216	596	292	283	412	973	-159	737	96	412
To increase financial assets:										
Demand deposits and currency..	600	-20	-140	-60	35	100	0	100	-9	-17
Equity in Farm Credit System..	-16	4	12	16	58	40	46	49	102	55
Nonlife insurance receivables.	92	62	71	91	201	140	161	217	244	243
Total uses.....	4,013	4,992	4,310	4,843	6,706	6,624	6,010	7,683	6,445	6,770
<b>3b. Sources of funds</b>										
Increase in debt.....	675	911	1,600	2,406	4,050	3,983	4,326	4,315	3,669	3,955
From cash flow.....	3,338*	4,081*	2,710*	2,437*	2,477*	2,641*	1,684*	3,368*	2,776*	2,815*
Total sources.....	4,013	4,992	4,310	4,843	6,706	6,624	6,010	7,683	6,445	6,770
<b>3c. Sources of funds</b>										
Increase in debt.....	675	911	1,600	2,406	4,050	3,983	4,326	4,315	3,669	3,955
From cash flow:										
Capital consumption allowances	1,812	3,202	3,914	4,380	5,778	4,981	5,282	5,747	6,207	6,673
From net income.....	1,526*	880*	-1,204*	-1,943*	-3,121*	-2,340*	-3,598*	-2,379*	-3,431*	-3,858*
Total sources.....	4,013	4,992	4,310	4,843	6,706	6,624	6,010	7,683	6,445	6,770

Source: Flow of Funds Accounts, Board of Governors of the Federal Reserve System, as of January 21, 1971.

The data on sources of funds indicate that the changed financial behavior glimpsed by Johnson in the late 1950's persisted through the following decade. Table 3b shows that the level of internal financing stabilized significantly below that of the 1950's, while annual increases in debt rose greatly--by enough, in fact, to meet the entire increase in capital formation. Table 3c indicates that capital consumption allowances also rose significantly in the 1960's--a natural consequence of increased expenditures for farm machinery. The combined rise in capital consumption allowances and in additions to debt was more than enough to finance the growth in capital formation. By 1965-69, an annual average of \$3,121 million of the funds received by farmers through borrowing and capital consumption allowances was diverted to uses other than capital formation.

Further discussion of the Farm Business Sector account appears in Appendix A.

Study III: Melichar and Doll

In the late 1960's, Emanuel Melichar and Raymond J. Doll prepared an analysis and projection of farm capital and credit requirements at the request of the Steering Committee for the

Fundamental Reappraisal of the Discount Mechanism, which had been appointed by the Board of Governors of the Federal Reserve System. Melichar and Doll examined changes in capital and credit stocks and flows since 1950 and projected these variables to 1980. They employed a flow of funds account patterned after that of Johnson, using flow data obtained from The Balance Sheet of the Farming Sector and The Farm Income Situation. Their accounts for 1950-69, as updated for this paper, are presented in Table 4.

In a major innovation, Melichar and Doll attempted to resolve the dilemma involving capital and credit flows in transfers of real estate, by adding the appropriate quantity of transfer flows to the uses of funds. After working out the effects of various transfer situations, they determined that this figure should be the amount of funds actually withdrawn from the farming sector by the sellers, mainly through sales by retiring or retired farmers and by nonfarmer heirs, which they estimated as shown in Table 4a. With these flows added, the uses of funds shown in Table 4a are no longer restricted to new capital formation. Melichar and Doll referred to the total uses as "capital flow."

Given these estimates, Table 4c indicates that total capital flow has continued to exceed the combined increase in debt plus capital consumption allowances. Thus, as Johnson had suspected, farmers continued to allocate some of their net income toward meeting their capital requirements, although the proportion was much reduced from that of the early 1950's.

Table 5c presents the relationships over 1950-69 among capital flow, internal financing, external financing, and various measures of cash flow and income. Most of these comparisons are similar to those made by Tostlebe. But also shown are comparisons of the type presented by Melichar and Doll, who included nonfarm income of the farm population in their net income data in

Table 4. Capital and Financial Flows in the Farming Sector, by Selected Periods, 1950-1969  
(Millions of dollars)

Item	Annual average				Annual				
	1950-1954	1955-1959	1960-1964	1965-1969	1965	1966	1967	1968	1969
<b>4a. Uses of funds</b>									
Gross capital expenditures:									
Vehicles, machinery, and equipment--									
Tractors .....	725	638	642	1,036	898	1,090	1,102	1,093	998
Trucks .....	411	351	380	642	577	615	636	677	707
Automobiles .....	500	470	592	671	646	695	657	670	687
Other machinery and equipment .....	1,440	1,344	1,591	2,394	2,097	2,349	2,799	2,315	2,409
Buildings and land improvements--									
Farm operators' dwellings .....	633	528	479	487	459	467	493	490	525
Other .....	905	858	795	802	763	777	817	807	848
To increase inventories:									
Livestock .....	477	91	259	110	-175	207	76	217	227
Stored crops .....	81	167	- 43	302	1,169	-288	583	-101	147
To increase financial assets:									
Currency .....	- 55	- 67	- 12	33	37	0	46	55	29
Demand deposits .....	39	- 68	- 64	73	80	0	102	117	64
Time deposits .....	86	81	158	354	298	322	434	406	311
U.S. savings bonds .....	50	- 54	-100	- 93	-152	-132	-135	- 34	- 13
To transfer real estate (estimate of that portion of the proceeds withdrawn from the farming sector by the sellers) ...									
	<u>2,315</u>	<u>2,835</u>	<u>3,354</u>	<u>4,320</u>	<u>4,115</u>	<u>4,435</u>	<u>4,211</u>	<u>4,111</u>	<u>4,729</u>
Total capital flow .....	7,605	7,174	8,031	11,132	10,812	10,537	11,821	10,823	11,668
<b>4b. Sources of funds</b>									
Increase in debt .....	943	1,634	2,486	3,889	4,139	4,386	4,446	2,996	3,478
From cash flow .....	<u>6,662*</u>	<u>5,540*</u>	<u>5,545*</u>	<u>7,243*</u>	<u>6,673*</u>	<u>6,151*</u>	<u>7,375*</u>	<u>7,827*</u>	<u>8,190*</u>
Total sources .....	7,605	7,174	8,031	11,132	10,812	10,537	11,821	10,823	11,668
<b>4c. Sources of funds</b>									
Increase in debt .....	943	1,634	2,486	3,889	4,139	4,386	4,446	2,996	3,478
From cash flow:									
Capital consumption allowances .....	3,235	3,915	4,397	5,778	4,982	5,281	5,746	6,207	6,672
From net income .....	<u>3,427*</u>	<u>1,625*</u>	<u>1,148*</u>	<u>1,465*</u>	<u>1,691*</u>	<u>870*</u>	<u>1,629*</u>	<u>1,620*</u>	<u>1,518*</u>
Total sources .....	7,605	7,174	8,031	11,132	10,812	10,537	11,821	10,823	11,668

Source: Melichar, Emanuel, and Doll, Raymond J., Capital and Credit Requirements of Agriculture, and Proposals to Increase Availability of Bank Credit, Board of Governors of the Federal Reserve System, 1969, p. 26, as updated for this paper by Emanuel Melichar. Based entirely on data from The Balance Sheet of the Farming Sector and The Farm Income Situation, U.S. Department of Agriculture, except that capital flows arising from real estate transfers have been estimated by Emanuel Melichar from data on real estate values and transactions published in The Balance Sheet of the Farming Sector and Farm Real Estate Market Developments, U.S. Department of Agriculture.

Table 5. Analysis of the Financing of Capital Flows in the Farming Sector, by Selected Periods, 1950-1969

Item	Annual average				Annual				
	1950-1954	1955-1959	1960-1964	1965-1969	1965	1966	1967	1968	1969
<u>Millions of dollars</u>									
<u>5a. Financing of capital flow (from Table 4)</u>									
Capital consumption allowances.....	3,235	3,915	4,397	5,778	4,982	5,281	5,746	6,207	6,672
From net income.....	3,427	1,625	1,148	1,465	1,691	870	1,629	1,620	1,518
From cash flow.....	6,662	5,540	5,545	7,243	6,673	6,151	7,375	7,827	8,910
Increase in debt.....	943	1,634	2,486	3,889	4,139	4,386	4,446	2,996	3,478
Total capital flow.....	7,605	7,174	8,031	11,132	10,812	10,537	11,821	10,823	11,668
<u>5b. Sources of cash flow</u>									
Capital consumption allowances.....	3,235	3,915	4,397	5,778	4,982	5,281	5,746	6,207	6,672
Net farm income.....	14,782	12,652	13,667	16,483	15,321	17,776	15,528	16,334	17,457
Farm cash flow.....	18,017	16,567	18,064	22,261	20,303	23,057	21,274	22,541	24,129
Nonfarm income.....	6,374	6,626	8,141	11,199	10,045	10,464	10,881	11,829	12,775
Total cash flow.....	24,391	23,193	26,205	33,460	30,348	33,521	32,155	34,370	36,904
<u>Per cent</u>									
<u>5c. Analytical ratios</u>									
Capital flow as percentage of--									
Farm cash flow.....	42	43	44	50	53	46	56	48	48
Total cash flow.....	31	31	31	33	36	31	37	31	32
Percentage of--									
Farm cash flow used for capital.....	37	33	31	33	33	27	35	35	34
Total cash flow used for capital.....	27	24	21	22	22	18	23	23	22
Net farm income used for capital.....	23	13	8	9	11	5	11	10	9
Total net income used for capital.....	16	8	5	5	7	3	6	6	5
Percentage of capital flow financed by--									
Increase in debt.....	12	23	31	35	38	42	38	28	30
Cash flow.....	88	77	69	65	62	58	62	72	70
	100	100	100	100	100	100	100	100	100
Increase in debt.....	12	23	31	35	38	42	38	28	30
Cash flow:									
Capital consumption allowances.....	43	54	55	52	46	50	48	57	57
Net income.....	45	23	14	13	16	8	14	15	13
	100	100	100	100	100	100	100	100	100

Source: Data on financing of capital flow are from Table 4. Components of cash flow are based on data from The Farm Income Situation, U.S. Department of Agriculture, July 1970.

recognition of the probably increasing impact of nonfarm income on farmers' financial decisions.

In brief, the analytical ratios demonstrate, first, that capital flow requirements remained at about one-third of total cash flow (including nonfarm income) during the past two decades. However, the percentage of total cash flow allocated to meeting capital requirements declined from 27 per cent in 1950-54 to about 22 per cent during the 1960's. Thus the percentage of capital flow financed by increases in debt rose from 12 per cent to 35 per cent over this period, while the proportion financed internally declined from 88 per cent to 65 per cent. By 1965-69, the bulk of internal

financing could be regarded as coming from capital consumption allowances, with only 13 per cent of capital flow being financed out of net income. The latter allocation amounted to 9 per cent of net farm income, or to 5 per cent of combined net farm and nonfarm income. The study by Melichar and Doll illustrates how knowledge of these relationships may be helpful in projecting farm credit demands.

Appendix A is available upon request from E. Melichar, Federal Reserve Board, Washington, D. C., 20551.