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THE ALLOCATION OF CREDIT TO SMALL FARMERS IN TANZANIA AND ZAMBIA

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78 E-55

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As agricultural production shifts from traditional methods (where land and labor are the major inputs and seed often is saved by the farmer) to more modern methods in which more of the inputs are produced off the farm, farmers' savings in Third World countries may be insufficient to purchase the needed inputs for cash. Thus credit may have to be provided from some source. Many governments have established agricultural development banks to increase the lending available to the agricultural sector and have experienced low repayment rates [1]. Some writers have suggested that loans be made through cooperatives or a similar political group where selection of the borrowers is made by the group and there is group pressure for repayment. This study examines the experience of loans allocated through this type of arrangement to ujamaa villages in Tanzania and to small private farmers in Zambia.

Tanzania established the Tanzanian Rural Development Bank (TRDB) in 1971 and Zambia the Agricultural Finance Company (AFC) in 1970 to provide increased capital to the agricultural sector. Although both organizations make loans to both large and small farmers, this study concentrated on small farmer experience. In Tanzania the thrust of TRDB lending has been to ujamaa villages and cooperatives. The screening committee is made up of the TRDB regional manager,

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regional government ministry officials, and the local member of parliament. Data were collected from 50 ujamaa village officials on production, income, and loan experience on their communal operations [2]. On 49 of these villages data were collected for 4 crop years while for 32 villages data were collected for only two years; it is the experience in Iringa region of villages with 4 years' data (1973-1976) that is being reported here.

Zambia has 42 AFC branch offices in different districts; in 1975 a decision was made to experiment with loan applicants being screened by Ward Development Committees (WDCs) in selected districts. The ward is a political unit; the committees were to screen applications and assist in collection with AFC personnel having the final decision of loan approval. Data were collected from 123 small farmers located in districts in which the WDC experiment was being conducted; data relate to the 1975 and 1976 crop years [3].

In Tanzania village officials must go to the regional TRDB office to make application for the loan; there are 19 of these offices. In Zambia, the application forms could be obtained from one of the 42 AFC offices or from the Agricultural Assistants (AAs); the offices of the AAs were located much closer to the farmers than the AFC offices. In Zambia each application carries a confidential report by the AA as to the farmer's production, ability to repay, and so forth; in addition, in two-thirds of the sampled cases, the AAs assisted in the completion of the application. Thus the AAs were much more involved in Zambia than in Tanzania.

Experience in lending

What has been the experience in each country with this lending procedure? First, it must be pointed out that 1973 and 1974 were drought years in Tanzania and the Iringa region from which the data were obtained was affected by the

drought. In 1974 open market prices for maize were double the government guaranteed price. Furthermore, during the 1975 and 1976 crop years Tanzania was intensifying its "villagization program" in which farmers were being moved from scattered holdings into villages so that education, health and water facilities could be provided more inexpensively and communal production could aid development. Thus some ujamaa villages which had formed voluntarily previously had additional families added in 1975; new houses had to be built; new government policies explained; there was much uncertainty among the farmers about the policy; many were angry and uncertain about the future.

In Zambia 1975 and 1976 were normal crop years; in general farmers approved the WDC procedure and official government prices had been increased in 1976. The price of the major domestic food crop, maize, had been increased from K4.95 to K6.30 per bag of 90 kg.--an increase of 27 percent. (This is $6.58 (1975) and $8.38 (1976) per bag at the prevailing exchange rates of K1=$1.33).

In Tanzania the ujamaa villages sampled grew tobacco and maize or maize and/or wheat plus other minor crops. Maize prices increased from Ts. 0.50 in 1973 to 0.75 in 1974-75 and 1.0 in 1976 per kg.; this is 45 shillings per 90 kg. in 1973, 67.5 in 1974-5, and 90 in 1976. (This is equivalent to $6.30 per 90 kg. bag in 1973, $9.45 in 1974-5, and $12.60 in 1976). Thus Tanzanian prices were significantly (approximately 30 percent) higher than Zambian prices for the two comparable years (1975-76).

Procedures for obtaining the loans

In Tanzania the sample was divided between the major small farm borrowers in the region--villages which produced tobacco (the export crop) or maize (the food crop). Those ujamaa villages which grew tobacco (and maize) were given prescribed quantities of tobacco inputs per acre plus extension assistance in

production, harvesting, drying, and marketing by the government purchasing agency (Tobacco Authority of Tanzania--TAT). The cost of tobacco inputs was deducted from the sale price and the proceeds deposited in National Bank of Commerce accounts. For those villages concentrating on food crops on their communal operations, inputs were delivered in prescribed and constant amounts per acre by Kilimo (Ministry of Agriculture) staff; village officials could sell the produce to the government purchasing agency (National Milling Company) or on the open market, or allocate it to the ujamaa village members on the basis of their labor inputs. Repayment was to be made in cash to TRDB or deducted from sales at the National Milling Company, if so authorized.

In Zambia AFC officials worked out a package of inputs variable by size of farm; stop orders were signed; when maize was delivered to the government purchasing agency (Namboard) or to the cooperatives, the amount of inputs was deducted from the sale price and the remainder paid the farmer at a later date. In both countries the loan was for inputs in kind except, in both countries, a small amount of cash could be obtained for hiring labor or tractor services. Tanzania has now dropped this cash part of the loan.

In order to be able to repay the loans, there must be more than a willingness to repay. There must be enough income generated to make repayment possible (assuming no cash reserves). Thus data on production costs and returns were generated as well as repayment experience. In Zambia all of the loans were for seasonal inputs. In Tanzania some of the ujamaa villages had borrowed for agricultural machinery, maize grinders, shop operations, and seasonal inputs. All of these items were for the communal operations; no data were obtained for production on the private plots; individuals who were members of the ujamaa village could not borrow from TRDB for private production. (In general private farms were 1 to 2 acres.)

Tanzanian experience

Tobacco Villages

The villages were divided between tobacco and food crop villages, depending on their major source of income. Data presented in Table 1 are for the same 28 villages producing tobacco communally for the 4 years. It will be noted that the acreage of tobacco per village increased each year until 1976 and that yield per acre increased each year except in 1975. Total cash income increased materially over time being five times higher in 1976 than in 1973. Costs of production to the villages for all communal enterprises had increased almost four times during the period leaving average net returns per village of 742 shillings in 1973 to 36,931 in 1976. (This was equivalent to $104 and $5,170 per village respectively.) However, when net returns per labor day were calculated, the result was less than 1 shilling (less than 14¢) in 1973 and 2.6 shillings (36¢) in 1976. This is not an impressive incentive to encourage communal work.

Also calculated were costs from the standpoint of Tanzanian society; these costs were significantly different from the costs as seen by the villagers as the villagers probably do not consider depreciation nor free inputs as costs. (Not included in these costs to society were the subsidized part of the input costs, loss of interest on capital provided, or costs for extension or other government services provided. Many of the latter were provided to all farmers.) Total costs of production increased materially when viewed as costs to Tanzanian society because of the high cost of maize inputs and the relatively low yields of maize on the communal plots. Thus although average net returns from the tobacco communal enterprise per village were positive each year, net returns from the total communal operation were negative in 1973 but positive thereafter; these net returns averaged -409 shillings in 1973 (-$57) and 33,847 shillings ($4,739) in 1976 per village.

Data on amounts repaid each year are shown in Table 1; since most of the tobacco villages had borrowed for tobacco, maize inputs, and grinding mills (but not for farm machinery), repayment rates each year were high--89 percent the first two years and 72 and 76 percent for 1975 and 1976. However cumulative arrears had grown to almost 41,000 shillings per village ($5,740) by 1976 and the overall arrears rate for tobacco and other loans to 50 percent. On average there was a capacity to repay the season tobacco loan as average tobacco income was greater than costs of tobacco inputs; however 11, 9, 15 and 14 of the 28 villages had negative tobacco returns from 1973 to 1976.

One of the important conclusions is that the tobacco villages would have had net returns at just about the same level if they had produced only tobacco communally; the maize inputs were much more costly than maize returns and the maize added materially to labor requirements.

Food crop villages

When attention was focused on the food crop villages, most of which were producing maize, the situation deteriorated rapidly (Table 2). Maize acreages were substantial, averaging 192 acres per year; many of the villages had borrowed heavily for mechanized farm machinery in 1971 and 1972; maize yields were low resulting in average net returns per village which were highly negative each year for Tanzanian society but negative for only 1 year from the standpoint of the villages.

Maize and wheat inputs were supplied by Kilimo through the cooperatives in the first two years. Although the value of inputs was considered a loan by the government, village officials claim this was not explained to them when inputs were delivered; village officials considered the inputs a grant or gift from the government. This is not surprising as considerable amounts of other

Table 1. Average Production Costs, Returns, Loans and Repayment per Village for the Same Tobacco Ujamaa Villages, Tanzania, 1973-1976

	1973	1974	1975	1976
Number of villages	28	28	28	27
Acres of tobacco	19	27	46	34
Yield per acre (kg.)	210	256	178	358
Total communal acreage	30	43	75	86
		Tanzanian shillings		
Total cash income	21,819	43,740	63,053	102,501
Total value of production	21,819	46,968	79,260	120,401
Percentage of production sold	100	93	80	85
Total cost of production (to village)[1/]	21,077	25,179	70,236	83,470
Net returns[2/]	742	21,789	9,024	36,931
Total tobacco loan	16,558	22,722	52,194	56,880
Total loan each year	20,722	23,299	56,123	74,308
Repayment each year	14,737	20,222	40,169	56,527
Total arrears	6,091	8,894	26,274	40,964
Repayment percentage (each year) (%)	89	89	72	76
Total arrears rate (%)	--	17	38	50
For Tanzanian Society				
Total cost of production[1/]	22,309	32,083	71,881	86,554
Net returns[2/]	-409	14,885	7,379	33,847

1/ Excludes land and labor. Costs to the village exclude depreciation and inputs given free or at less than market cost.

2/ Net returns equal total value of production minus total costs of production.

Table 2. Average Production Costs, Returns, Loan and Repayment per Village; Same Food Crop Villages, Tanzania, 1973-1976

	1973	1974	1975	1976
Number of villages	21	21	21	21
Acres maize	190	195	185	200
Yield per acre, maize (bags of 90 kg.)	5.0	5.6	3.9	3.8
		Tanzanian shillings		
Total value maize production	37,459	72,080	63,488	67,419
Total cash income	31,823	38,757	64,429	61,638
Total value of production	58,885	97,997	89,252	81,105
Percentage of production sold	54	40	72	76
Total inputs (to village)	95,718	27,595	27,112	25,823
Total costs of production[1/] to village	95,718	27,595	27,112	25,823
Net returns[2/]	-36,833	70,402	62,140	55,282
Total loan for year	164,647	84,509	38,365	23,510
Repayment	24,219	25,219	46,843	45,265
Total arrears	148,374	156,362	149,253	117,830
Repayment percentage each year (%)	15	30	122	193
Total arrears rate (%)	86	89	76	74
For Tanzanian society				
Depreciation	17,100	18,458	18,458	19,229
Total production costs[1/]	112,818	109,974	166,733	96,604
Net returns[2/]	-53,933	-11,977	-77,481	-15,499

1/ Excludes land and labor. Costs to the village exclude depreciation and inputs given free or at less than market cost.

2/ Net returns equal total value of production minus total costs of production.

items were supplied free from Rural Development Funds. Thus officials were confused between inputs which were allocated as loans and inputs which were grants. Moreover the policy regarding maize inputs changed each year. In 1973 they were delivered by the cooperatives as a loan at a fixed quantity per acre based on the estimated acreages to be planted. Usually actual acres planted fell below estimates and inputs (of fertilizer, seed and chemicals) had to be recovered. Estimates used in this study are based on actual acreages planted rather than estimated acreages. In 1974 all maize inputs were given as a grant but charges were made for wheat and other inputs. In 1975 maize inputs also were free but in 1976 villages had a choice of the package of inputs and were charged 25 percent of the cost. Thus costs to Tanzanian society (at the bottom of Table 2) reflect total costs whereas costs to the villages do not reflect costs of inputs given as grants or of depreciation.

Given this cost structure, average net returns from the viewpoint of the villagers were -36,833 in 1973 but were positive each other year amounting to 55,262 shillings per village in 1976 (-$5,157 and $77,370). This is a significant amount of money per village from 1974 to 1976.

Since the amount of the loan was large in 1973 and the amount of repayment was small, the repayment rate for the food crop villages was only 15 percent. Subsequently TRDB reduced the amount loaned (and maize inputs were grants) and amounts repaid improved over time, so that repayment rates per year improved to 30 percent in 1974 and 22 and 93 percent more than amounts borrowed in 1975 and 1976. However the cumulative total arrears per village were 117,830 shillings ($16,496) in 1976 and the overall arrears rate 74 percent.

From the standpoint of Tanzanian society, the costs of the communal production of these villages varied from 15,599 to 77,481 shillings ($2,184 to $10,847) per village during the period for those costs for which estimates

were available. Certainly the returns to high cost technological inputs were very low; it is not known how much factors such as land preparation, weeding, and other production practices or weather affected these yields. Yields can be compared only with those on expatriate farms which were much higher in spite of the drought conditions.

Factors influencing yields

Regressions were computed to ascertain those factors which best explained variations in tobacco yields, net returns and amounts repaid. Regressions were run for each of the two year periods; thus results must be given in the same manner. Tobacco yields varied greatly among villages; inputs per acre alone explained 47 percent of the variation in yield in 1973 while labor days per acre explained 17 percent; in 1974 these factors were not significant. Even though inputs per acre had a positive and significant regression coefficient of .121 in 1973, an increase in inputs did not produce an increase in net returns. Increasing inputs per acre by 1 shilling increased tobacco yield by .121 kg.; since tobacco sold for 5 shillings per kg. in 1973, increasing inputs per acre by 1 shilling increased gross returns by only .605 shillings per acre.

Inputs and labor days per acre together accounted for 50 percent of the variation in yields in 1973; thus other factors--time of planting, weather, soil type, land preparation and weeding--for which no data were available, probably were more significant in explaining variation in yields. Similar regressions were not calculated in 1975-76.

Factors influencing tobacco net returns of tobacco villages

Inputs per acre, labor days per acre, tobacco quality, and tobacco acreage explained 35 percent of the variation in net returns per acre from tobacco in

1973 and 53 percent in 1974. Inputs per acre alone explained 19 percent in 1973 and 36 percent in 1974. Although inputs per acre had significant regression coefficients for both crop years, the regression coefficients were negative; that is, as the level of inputs per acre increased, the net returns per acre decreased. Again factors other than those measured were more significant in explaining net returns from the tobacco communal enterprise than factors available. Similar regressions were not run for 1975-76.

Factors influencing amounts repaid and repayment rates

In 1975 and 1976 regression analysis was used to determine those factors which most influenced amounts repaid and the repayment rates each year. As mentioned earlier, repayment rates of seasonal loans for tobacco were high--averaging 72 percent in 1975 and 76 percent in 1976. Both total cash income and total value of production were good predictors of amounts repaid; the former accounted for 91 and 42 percent of the variation in 1975 and 1976 respectively and the latter for 83 and 45 percent./ (Table 3) A multiple regression using total cash income, net returns, total inputs (with and without depreciation--depreciation being an indication of capital equipment used) as variables explained 93 percent of the variation in 1975 and 73 percent in 1976. As expected the coefficients of the factors (used singly) were all positive; thus the higher the level of cash income, the higher repayment.

When regression analysis was used to ascertain those factors which best explain the variation in seasonal repayment rates, very different variables became important. The seasonal repayment rate was calculated by dividing the amount of repayment by the amount of the loan each year. Net returns alone explained only 16 and 13 percent each year, tobacco inputs per acre 35 and 11, and tobacco sales per acre 21 and 38. The multiple regression which explained the most of the variation (53 percent) was obtained by using total inputs with

Table 3. Regression Coefficients and Standard Errors,+ Dependent Variable, Repayments, Tanzania Tobacco Ujamaa Villages, 1975 and 1976

Equation	Year	a++	X_{25}	X_7	X_{12}	X_{11}	X_{26}	X_{38}	X_{35}	F-Value	R^2
1	1975	4,360 (3,744)	0.5679*** (0.0359)							249.6261***	0.9056
1	1976	30,471*** (9,651)	0.2561*** (0.0596)							18.4613***	0.4247
2	1975	-0 (5,467)		0.5162*** (0.0464)						123.7023***	0.8263
2	1976	[illegible]*** (9,908)		0.2477*** (0.0553)						20.0565***	0.4451
3	1975	[illegible]*** (7,509)			0.4769*** (0.1121)					18.0740***	0.4100
3	1976	53,073*** (9,935)			0.1019 (0.0808)					1.5900	0.0598
4	1975	-4,422 (11,966)				0.6203*** (0.1319)				22.1147***	0.4596
4	1976	[illegible]*** (10,[illegible])				0.2802*** (0.0788)				12.6436***	0.3358
5	1975	-3,195 (11,798)					0.6173*** (0.1319)			21.8784***	0.4569
5	1976	[illegible]*** (10,560)					0.2709*** (0.0812)			11.1413***	0.3082
6	1975	3,[illegible] (4,176)	0.5086*** (0.1093)	0.0598 (0.1040)						121.7663***	0.9069
6	1976	[illegible]*** (10,[illegible])	-0.0355 (0.3142)	0.2807 (0.2968)						9.6386***	0.4454
7	1975	197 (4,947)	0.6497*** (0.0515)		-0.1353** (0.0643)					143.4800***	0.9198
7	1976	[illegible]*** (9,657)	0.3335*** (0.0759)		-0.1269* (0.0806)					11.0174***	0.4786
8	1975	-3,[illegible] (4,459)	0.5055*** (0.0402)			0.1616*** (0.0617)				156.3055***	0.9259
8	1976	[illegible]** (9,589)	0.1908*** (0.0634)			0.1678** (0.0781)				12.8744***	0.5175

Table 3. Regression Coefficients and Standard Errors,+ Dependent Variable, Repayments, Tanzania Tobacco Ujamaa Villages, 1975 and 1976 (cont.)

Equation	Year	a**	X_{25}	X_7	X_{12}	X_{11}	X_{26}	X_{38}	X_{35}	F-Value	R^2
9	1975	-3,0[illegible]	0.5058***				0.1611***			156.4236***	0.9260
		(4,407)	(0.0401)				(0.0615)				
9	1976	23,599	0.1969***				0.1551**			12.1537***	0.5031
		(9,775)	(0.0641)				(0.0797)				
10	1975	6,[illegible]*	0.58[illegible]***					-3.8094		123.8363***	0.9083
		(6,016)	(0.0388)					(4.4850)			
10	1976	35,[illegible]***	0.299[illegible]***					-4.0303		9.9916***	0.4543
		(10,[illegible])	(0.0703)					(3.5346)			
11	1975	-2,[illegible]5	0.5321***		-0.0291	-0.0371	0.1759			72.2207***	0.9262
		(4,970)	(0.10[illegible])		(0.1056)	(0.9026)	(0.8755)				
11	197[illegible]	9,[illegible]	-0.20[illegible]		0.3828**	4.4400***	-3.9315***			14.8889***	0.7302
		(8,[illegible])	(0.2114)		(0.2086)	(1.0660)	(1.0534)				

+ Standard Errors are shown below the regression coefficients and enclosed in parentheses.
** a = Y intercept

* Significant at the 90% confidence level
** Significant at the 95% confidence level
*** Significant at the 99% confidence level

X_{25} = Total cash income, X_7 = Total value production, X_{12} = Net returns, X_{11} = Total input costs with depreciation
X_{26} = Total input costs without depreciation, X_{38} = Tobacco sales per acre, X_{35} = Tobacco inputs per acre

and without depreciation, tobacco sales per acre and tobacco inputs per acre.

Factors influencing total arrears

As shown in Table 1, the cumulative arrears rate was 17, 38, and 50 percent from 1974 to 1976. What factors best explained the amount of total arrears? Net returns alone explained 27 percent in 1973, 28 percent in 1974, 45 in 1975 and 17 in 1976; as expected the coefficients were negative, indicating that the higher net returns the lower total arrears. The multiple regression explaining the highest percentage of variation in total arrears was total value of production, net returns and total inputs (54, 55, 79 and 27 percent respectively from 1973 to 1976).

Thus, as logic would indicate, total arrears will decrease if loans (for total inputs) are kept low and the higher net returns, the lower total arrears.

Regression analysis for the food crop villages

Factors influencing yields

It was expected that maize acreage, labor days per acre and depreciation (a reflection of capital inputs) would be the independent variables which would best explain variation in maize yields since inputs per acre were constant for all the ujamaa villages except in 1976. These variables explained only 9 and 16 percent of the variation in yields in 1973 and 1974 respectively. These percentages were very low. Depreciation alone explained 30 percent in 1975 and 22 percent in 1976 and maize inputs 19 percent in 1976. A multiple regression including maize acreage, depreciation, maize inputs and labor days per acre explained 52 percent of the variation in 1975 and 38 percent in 1976.

Factors influencing maize net returns per acre

In 1973 and 1974 the variable which explained most of the variation in maize net returns per acre (on the communal maize) when used alone was maize yield which explained 64 and 94 percent of the variation, respectively. Labor days per acre, maize acreage, maize yield and depreciation accounted for 70 and 95 percent of the variation in 1973 and 1974 and 69 and 80 percent in 1975 and 1976.

In 1973 and 1974 all coefficients were positive except depreciation; thus as depreciation increased, maize net returns per acre decreased.

In 1976 maize inputs are those inputs for which villages paid only 25 percent of the cost. Taken individually, maize yield was significant in 1975 and 1976 ($p < .10$) and explained 31 and 17 percent of the variation; depreciation was significant only in 1976 when it explained 20 percent.

Factors influencing amounts repaid

Regressions were computed using the variables total value of production, total cash income, net returns, total costs of production (with and without depreciation) to attempt to explain the variation in amounts repaid. It must be remembered that repayments rates for the food crop villages were low in 1973 and 1974 averaging 15 and 30 percent respectively. Total value of production was the single most influential factor, all four years explaining 58, 80, 77, and 68 percent of the variation respectively. Total cash income alone explained 59, 63, 71, and 48 percent while net returns alone explained 56 percent in 1974.[1] The combined influence of total value of production, net returns and total production costs explained 65 percent of the variation in

[1] Net returns were not significant in 1973.

1973.[1] A multiple regression of total value of production, total cash income and total production costs explained 80 and 75 percent in 1975 and 1976 (Table 4). Factors influencing repayment rates were not analyzed for the 1973-4 sample. In 1975 and 1976 those variables which were most significant were total value of production, total cash income, maize net returns and production costs; these explained 59 and 76 percent respectively. The highest single predictor was maize net returns.

Factors influencing total arrears

As has been pointed out earlier, the higher borrowing, the higher were average total arrears per village, as would be expected. These average borrowings are reflected in the total cost of production since loans were obtained for both inputs and capital equipment. Total cost of production accounted for 23, 24, 11 and 31 percent of the total arrears for the four years while net returns alone accounted for 27, 28, and 25 percent (net returns were not significant in 1976). The regression coefficient for net returns was negative; as could be expected, the higher net returns, the lower the total arrears. When total value of production, net returns and total costs of production were thrown into the hopper, 54, 55, 62 and 64 percent of the variation in total arrears was explained.

Thus for some factors (amounts repaid, total arrears, and net returns) the data provided variables which could account for acceptable levels of explanation of variation; for other factors (especially yield) the data could account for only about 50 percent of the variation. One suspected that factors such as differences in soil quality, weather, soil preparation, weeding

[1] In 1974 these factors were not used due to multicollinearity.

Table 4. Calculated Regression Coefficients and Standard Errors+ Dependent Variable, Repayment, Tanzanian Food Crop Villages, 1975 and 1976

Equation	Year	a++	X_9	X_{22}	$X_{13}(X_{36})$	$X_{37}(X_{35})$	$X_{14}(X_{37})$	F-Value	R^2
1	1975	-226	0.5273***					61.9874***	0.7654
		(7,759)	(0.0669)						
1	1976	7,202	0.4693***					39.7262**	0.6764
		(7,186)	(0.0744)						
2	1975	2,242		0.6922***				46.1847***	0.7085
		(8,571)		(0.1018)					
2	1976	9,192		0.5852***				17.6942***	0.4822
		(9,890)		(0.1391)					
3	1975	-783			0.2856**			3.6556*	0.1613
		(26,607)			(0.1494)				
3	1976	13,640*			0.3273***			15.3369***	0.4466
		(9,548)			(0.0835)				
4	1975	8,817				0.2564*		2.4629	0.1147
		(26,065)				(0.1634)			
4	1976	16,118**				0.3766***		14.7441***	0.4369
		(9,166)				(0.0981)			
5	1975	69,005					0.2860***	6.4541**	0.2535
		(12,407)					(0.1125)		
5	1976	45,651***					0.0249	0.0365	0.0019
		(7,134)					(0.1303)		
6	1975	-15,508	0.2878**	0,2272*	0.3236*			22.7652***	0.8006
		(14,111)	(0.1643)	(0.1562)	(0.1879)				
6	1976	2,754	0.1593	0.2211	0.3533*			16.6852***	0.7464
		(7,537)	(0.2318)	(0.2210)	(0.2252)				

+ Standard errors are shown below the regression coefficients and enclosed in parentheses

++ a = Y intercepts

* Significant at the 90% confidence level

** Significant at the 95% confidence level

*** Significant at the 99% confidence level

X_9 = Total value production

X_{22}= Total cash income

$X_{13}(X_{36})$= Total inputs with depreciation

$X_{37}(X_{35})$= Total inputs without depreciation

$X_{14}(X_{37})$=Total net returns

and so forth would be important in accounting for variations in yield.

Zambian Experience

The Zambian data are in great contrast to the Tanzanian data in that they related to farmers in private production rather than communal production. The sample was deliberately chosen to represent three levels of economic development and income; the sample in Northern province being the most traditional and least developed, Central the most developed, and Southern at an intermediate level of development. Again comparable data were obtained on cash incomes, total value of production, total costs of production and net returns as well as on amounts borrowed and repaid. Data in Table 5 show means by level of development and for the total sample.

It will be noted that in each of the areas, farmers had much more cleared land than they had planted in crops. On average only 57 percent of their cleared acreage was planted; this varied from 24 percent in Northern province to 76 percent in Central. Thus agricultural production could be expanded materially.

The amount of equipment owned varied significantly between provinces. As would be expected, farmers in Northern province (the least developed) had the lowest average investment (K20 of agricultural machinery per farm) consisting mostly of hoes (5) and axes (3). In Southern province farmers had invested K82 per farm in hoes (5), axes (4), plows (2), cultivators (1), harrows (1), treck chains (4)[1] and Scotch carts[2] (1). In Central province (the most developed) farmers had invested K767 per farm; they had on average 6 hoes, 3 axes, 1 cultivator, 1 harrow, 3 treck chains, 1 Scotch cart, .2 planters and .2 tractors. Most of the farmers in this region which had tractors had purchased used tractors from the expatriate farmers.

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[1] A treck chain is a local term used for an implement which is a substitute

Table 5. Average Production Costs, Returns, Loans and Repayment Per Farm, Zambia, 1975 and 1976.

		Northern	Southern	Central	Total sample
Sample size	1975	41	41	41	123
	76	41	38	41	120
Acres in farm cleared	1975	25	22	41	30
	76	25	22	41	30
Acres in crops	1975	5	12	24	14
	76	6	14	31	17
Acres in maize	1975	4	9	15	9
	76	5	10	18	11
Yield of maize (in 90 kg. bags)	1975	12	16	11	13
	76	10	16	13	13
		K	K	K	K
Total cash income	1975	230	728	1,303	750
	76	285	1,064	1,742	1,030
Total value of production	1975	441	972	1,463	959
	76	447	1,357	2,036	1,278
Total costs of production[1/]	1975	98	158	447	234
	76	72	164	349	196
Net returns[2/]	1975	343	814	1,016	725
	76	375	1,193	1,687	1,082
Total loan (for year)	1975	95	129	228	140
	76	92	156	434	244
Repayment (each year)	1975	26	115	143	89
	76	2	138	424	216
Total arrears (cumulative)	1975	70	14	85	51
	76	160	32	95	79
Repayment rate (%)	1975	27	89	63	64
	76	2	88	98	88
Arrears rate (%)	1975	73	11	37	36
	76	86	13	14	22

1/ Excludes land and family labor costs.
2/ Net returns equals total value of production minus total costs of production

In all provinces livestock were owned by most farmers; these varied significantly by province with Northern farmers' animals valued at K107 per farm, Southern K1,958 and Central K2,094 in 1975. A significant addition to cash income was made by livestock sales each year.

The acres in crop increased significantly by level of development (Table 5); maize was the major crop grown in all regions but sunflowers, groundnuts, and finger millet also were produced. Maize constituted 63 percent of total production in 1975 and 72 percent in 1976; on average 78 and 84 percent of maize production was sold each year. Maize yields in bags of 90 kg. per acre were highest in Southern province (16) and lowest in Northern province (11); they averaged 12 bags in Central province. Hence the difference in yields from traditional methods of cultivation in Northern province and middle level technology in Central province was not marked.

Given the difference in acres planted, total cash income varied from K230 in Northern province to K1,303 in Central in 1975 and average total value of production from K441 to K1,463 the same year. Total costs of production also were significantly different among provincial samples with Central farmers' expenses being more than four times as high as those in Northern province. Net returns (total value of production minus total costs of production) varied from K343 ($456) in Northern province to K1,016 ($1,351) in Central province in 1975--a significant net return for small farmers. Net returns for all farmer groups improved in 1976; the government had increased the guaranteed prices for almost all marketed crops.

Loans and repayment

Although the sample was drawn from AFC lists of farmers who had been approved for a loan in 1975, it turned out that 24 and 35 percent of these farmers had not carried through and picked up the inputs in 1975 and 1976 respectively.

This was especially true in Northern province where the manager of the local AFC office had been ill in 1976. As a result repayments were low in Northern province and number of borrowers fell to 14 in 1976 out of a total sample of 41.

As a result of the fact that a quarter to a third of the farmers approved for loans did not borrow, some interesting data were generated comparing borrowers and non-borrowers (Table 6). In general the borrowers had larger farms, a larger number of acres planted and more acres planted to maize; however, maize yields per acre were higher for the borrowers in 1975 and identical in 1976; average cash inputs and cash inputs per acre were higher for the non-borrowers in 1975 but identical in 1976. Average net returns were higher for the borrowers.

As would be expected, farmers at lower levels of development were more dependent on AFC for inputs than at high levels of development; thus Northern farmers financed 90, Southern 83 and Central 80 percent of their cash inputs by the AFC loan in 1975.

The average loan for the borrowers was K140 in 1975 and K244 in 1976. The average repayment rate was 64 percent in 1975 and 88 percent in 1976; the average repayment rate had improved in 1976 in spite of a 2 percent repayment rate in Northern province where the manager was ill. Repayment by province is shown in Table 3. Total cumulative arrears averaged K79 per farm in 1976 with an average arrears rate of 22 percent.

Factors responsible for maize yields

Among the explanatory variables accounting for the variation in maize yields, it is not surprising that maize acreage accounted for R^2s of 53 and 61 percent. Depreciation (a proxy for capital inputs) explained 22 and 23 percent, cash inputs 38 and 35 percent and total value of production 72 and

Table 6. Comparison of Average Factors Between Borrowers and Non-Borrowers, Zambia, 1975 and 1976

	Borrowers		Non-Borrowers	
	1975	1976	1975	1976
Number in group	94	78	29	42
Size of farm (acres)	27	31	39	30
Acres planted	12	19	19	13
Maize acres	8	13	12	8
Maize yield/acre (bags)	14	13	10	13
	K		K	
Value maize prod.	593	1,081	639	624
Total cash income	878	1,202	964	710
Total value of prod.	936	1,483	1,032	898
Cash inputs	174	198	304	110
Depreciation	22	24	46	38
Total production costs[1/]	196	222	350	148
Net returns[2/]	740	1,261	682	750
Cash inputs/acre of maize	21	15	25	15
Rung on ladder	4	5	4	4
Age	49	48	52	53
Education	3.7	3.7	4.0	3.7
Number in family	9.5	10.2	10.9	9.3
Number in family farming	4.9	5.6	5.6	4.4

1/ Excludes land and family

2/ Net returns equals total value of production minus total costs of production

88 percent of the variation each year. A multiple regression with maize acreage, total value of production and cash inputs explained 77 and 90 percent of the variation.

However, when calculations were made on maize yields per acre the R^2s were much lower with net returns explaining 12 percent, cash inputs 10 percent, AFC loan for the year 6, and total cost of production plus net returns 21 percent in 1976.

Factors explaining variation in repayment

Taken individually total cash income (25 and 41 percent) and maize sales (29 and 49 percent) were most important in explaining variation in amounts repaid each year. Total production costs explained 13 and 38 percent and net returns alone 20 and 30 percent. Table 7 A multiple regression including maize sales, number in the family farming, and total costs of production explained 29 and 57 percent. For the farmers who borrowed, number in the family and number in the family farming[1] were significant in explaining the variation in repayment only in 1976 and in that year explained 7 and 15 percent respectively; age of the operator was significant only in 1975 and explained only 4 percent of the variation.

Factors which explained other aspects of the farming enterprise

For the Zambian sample it was possible to run some regressions to determine the significance of family characteristics on the farming enterprise. Age of the farm operator was significant in determining number of acres planted but accounted for only 3 percent. Age was also significant in determining net returns but accounted for only 5 percent; furthermore the coefficient was

[1] Number in the family farming was calculated by equating the work of a man or woman for a year as 1 unit, children 14 years and over 1/2, children under 14 were not counted. If persons worked less than 12 months, they were counted on a percentage basis.

Table 7. Regression Coefficients and Standard Errors+ on Repayment of Borrowers, Zambia, 1975 and 1976

ation	Year	a++	X_{34}	X_9	X_{13}	X_8	X_{12}	X_{27}	X_{29}	X_6	X_{26}	F-Value	R^2
1	1975	36.5976***	0.0769***									30.2596***	0.2475
		(13.1110)	(0.0140)										
	1976	5.5024	0.1752									53.3747***	0.4126
		(39.1925)	(0.0240)										
2	1975	25.9993*		0.0677								26.2804***	0.2222
		(17.1380)		(0.0132)									
	1976	-11.1507		0.1533***								54.0688***	0.4157
		(40.7401)		(0.0208)									
3	1975	31.9662**			0.0773***							23.5622***	0.2039
		(16.8818)			(0.0159)								
	1976	32.2300			0.1416***							32.1193***	0.2971
		(40.6265)			(0.0250)								
4	1975	76.1706***				0.1639**						2.8355*	0.0099
		(15.1949)				(0.0973)							
	1976	29.5458***				-0.1520						0.5763	0.0075
		(36.5407)				(0.2002							
5	1975	51.2755***					0.1935***					13.3666***	0.1269
		(16.3169)					(0.0529)						
	1976	37.3782					0.8080***					47.5019***	0.3846
		(37.5639)					(0.1172)						
6	1975	62.4019**						2.8208				0.7269	0.0078
		(34.2972)						(3.3086)					
	1976	28.6988						18.3893***				5.8363**	0.0713
		(83.4664)						(7.6120)					
7	1975	54.7914**							7.0100			1.4495	0.0154
		(31.2077)							(5.8427)				
	1976	-47.0559							47.1898***			13.1459***	0.1475
		(79.3196)							(13.0153)				
8	1975	91.4962**								0.1289***		37.0152***	0.2869
		(14.9160)								(0.0212)			
	1976	-17.1605								0.2586***		72.0960***	0.4868
		(37.0654)								(0.0305)			
9	1975	183.8%***									-1.9379**	3.6934*	0.0386
		(50.9428)									(1.0084)		
	1976	96.0134**									-0.8438	0.0930	0.0012
		(137.422)									(2.7677)		
0	1975	34.0905					-0.0016		0.1127	0.1293***		12.0706***	0.2869
		(27.4654)					(0.0657)		(5.2234)	(0.0289)			
	1976	-134.089**					0.4224***		19.6161**	0.1633***		42.6684***	0.5698
		(58.5579)					(0.1253)		(10.1446)	(0.0379)			

(See over)

ignificant at the 90% confidence level in the one-tailed test
ignificant at the 95% confidence level in the one-tailed test
ignificant at the 99% confidence level in the one-tailed test

= Total cash income

= Total value production

= Net returns

= Other cash income

= Total production cost

= # in a family

= # in farming

= Maize sales

= Age

+ Standard errors are shown below the regression coefficients and enclosed with parentheses
++ a = intercepts

negative indicating that as age increased, net returns decreased. Number in the family farming was much more important than number in the family in explaining variation in factors relating to the farm enterprise, as shown below:

	No. in family		No. in family farming	
	1975 R^2	1976 R^2	1975 R^2	1976 R^2
Acres planted	11	6	28	17
Maize yield	4	4	6	14
Total value of production	3	4	3	14
Total cash income	3	5	not sign.	15
Total cost of production	4	3	not sign.	8
Net returns	not sign.		not sign.	
Repayment (borrowers only)	not sign.	7	not sign.	15

Summary and conclusions

As agricultural production shifts from traditional to more commercial methods where a larger percentage of the crop is marketed, small farmers' savings may be inadequate to purchase the new inputs and credit may be necessary. Many governments of Third World Countries have established agricultural development banks to increase the credit available to the agricultural sector. Since repayment rates have been disappointing in many of these experiences, both Tanzania and Zambia experimented with lending through the development banks to cooperatives or politically organized groups of farmers in the hope of increasing repayment rates and social responsibility. In Tanzania the Tanzanian Rural Development Bank (TRDB) loaned to the ujamaa village officials for communal operations; in Zambia the Agricultural Finance Company (AFC) made loans directly to private farmers but the Ward Development Committee (WDC)--a political organization--screened potential borrowers and, in theory, was to

exert pressure on them to repay. This study assesses these experiences in these two countries in East and Central Africa. The sample in Tanzania covers the same ujamaa villages for a four year period (1973-76); the Zambian sample covers the 1975 and 1976 crop years. In each country data were obtained on the capacity of the borrowers to repay as well as their repayment experience.

In Zambia average/seasonal repayment rates were higher than in most developing countries in which agricultural credit has been extended to small farmers; they were 64 percent in 1975 and 88 percent in 1976. The Ward Development Committee procedure improved the method of selection (and was popular with the farmers) but did not improve repayment. This was tested especially in Northern province. When the AFC manager became ill, the WDC should have taken over to supervise and encourage repayment; this did not happen and repayment rates were much lower in 1976 than in 1975. In the judgment of the writer the training and participation of the AFC manager is highly important in obtaining high rates of repayment.

In Tanzania the method of allocating credit through the TRDB to the ujamaa village officials (which are cooperatives) also produced high repayment rates (89, 89, 72, and 76 percent each year) for the mostly non-consumable export crops (tobacco and coffee). Repayment rates for the food crop villages were low the first two years (15 and 30 percent); however, in the third and fourth crop years when all of the maize sales were automatically allocated to loan repayment, the repayment rate improved materially. It is doubtful if this procedure could be maintained for additional years because of the low returns to the labor allocated.

In both countries TRDB and AFC personnel were attempting to maintain a high repayment rate; staff were well trained and professional in their

attitudes. Staff were constrained by lack of transport at times. In both countries farmers and ujamaa village officials thought highly of the credit programs and the manner in which they were administered; they were critical of the late delivery of inputs and of the government's price policy in Tanzania.

When regressions were run to determine those factors which most influenced variation in amounts repaid, total cash income and total value of production were the best single predictors for the Tanzanian tobacco growing ujamaa villages; a multiple regression using total cash income, net returns, and total costs of production as variables explained 93 percent of the variation in 1975 and 73 percent in 1976. Total value of production and total cash income also were the best predictors for repayment by the food crop villages in Tanzania; a multiple regression using total value of production, net returns and total costs of production explained 65 percent of the variation in 1973. For the Zambian sample, cash income and maize sales were the best single predictors of amounts repaid. A multiple regression using maize sales, number in the family farming, and total costs of production explained 29 and 57 percent of the variation in 1975 and 1976 respectively.

References

(1) A good summary of experience can be found in Donald, Gordon, Credit for Small Farmers in Developing Countries, Westview Press, Boulder, Colorado: 1976.

(2) Due, Jean M., "Agricultural Credit in Tanzania," Illinois Agricultural Economics Staff Papers No. 77 E-2, No. 77 E-15, 1977 and No. 78 E-38, 1978 (Mimeo).

(3) Due, Jean M., "Agricultural Credit in Zambia by Level of Development," Illinois Agricultural Economics Staff Paper No. 78 E-43, 1978 (Mimeo).