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The Impact of Inflation on Investment in Agricultural Capital

Y. Plessner, J.D. Reid, Jr.

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Principal Investigator:

Yakir Plessner

Cooperating Investigator:

Joseph D. Reid, Jr.

Name and Address of Affiliated
Institutions:

Grantee Institution:

Center for Agricultural Economic
Research, P.O. Box 12, Rehovot,
Israel.

Cooperating Institution

Center for Study of Public Choice,
V.P.I., Blacksburg, Va., 24061, USA.

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c. Abstract

Nimrodi and Shalit concentrated on the impact of risk on the choice of agricultural activities by farmers. The question is especially important in a country where overbearing government intervention might create among farmers the illusion of absence of risk. The conclusions are (a) that farmers are very conscious of risk and (b) that risk declines with higher levels of technology.

Kislev and Duvdevani focused on the impact of inflation on the balance sheet of a single moshav, looked at this time in its role as financial intermediary. They report, among other findings, that moshav members as a group and the moshav as a financial intermediary benefitted from inflation. But benefits were distributed unequally, since debt was so distributed. Moreover, members who were net creditors to the moshav did not benefit from inflation at all. The study exposes the weaknesses inherent in the kind of mutual insurance that characterizes the moshav cooperative.

Gal and Zusman dealt squarely with the central topic of this project namely, the impact of inflation in Israel on the formation of agricultural capital. Concentrating on a cooperative farming community of a "moshav" farm, they found three substantial effects of the inflation during the seventies. First, it turned out that terms of trade have deteriorated appreciably over the investigated decade, as prices of inputs rose more rapidly than output prices. Secondly, rising inflation was accompanied by negative real rates of interest, which encouraged borrowing and investment but discouraged savings. Thirdly, rapid inflationary erosion of debt caused quick accumulation of equity.

Risk and Return of Family Farms in Israel

Shlomo Nimrodi and Haim Shalit

Introduction

The purpose of this research is to analyze the causes and factors that determined the choice of agricultural activities (branches) and their level in family farms in Israel.

Three main reasons are usually advanced as arguments for explaining the industrial structure of these farms. The first is related to the wave of new immigrants that came immediately after the establishment of statehood in 1948 to 1952. These immigrants that were directed toward family farming received an agricultural infrastructure that dictated the choice of crops and activities. The second reason is rooted in the geographical location of the farms that impose specific composition of activities due to agroclimatic conditions. The third reason which is the purpose of the paper claims that the farm structure depends upon the farmers decision and is the result of their attitude toward return and risk.

The family farm in Israel is organized mainly in Moshavim that are cooperative villages but in general, the individual member retains all his discretion with respect to production choices and activities. Therefore all decision regarding the allocation of limited factors, such as land, capital, and labor, among various activities remain the domain of the individual member in that moshav.

In the present study, we will analyze the choice of activities that resulted from the perception to risk of the individual farmer. In past studies (Sadan 1971), only the sensitivity toward return was analyzed. Here we want to learn what are the factors influencing the choice of farming activities in uncertainty; what is the level of return and risk in various farming industries; and what is the link between risk and farm structure.

In the paper we will estimate the risk factors of the various activities, establish the farm's optimal structure according to a general risk criterion, and test that structure with the present composition of activities.

Risk Diversification in Agricultural Production

Consider a family farm whose goal is to maximize the expected utility of profit from agricultural production. To attain that objective, the farmer allocates his constrained inputs, labor and capital, among the different branches. Instead of using the general expected utility framework, mean-variance analysis was conducted as follows.

The production function of activity i is given by

$$Q_i = f_i(K_i, L_i, \alpha) + h_i(K_i, L_i, \beta) \varepsilon_i$$

$$E(\varepsilon_i) = 0 \quad ; \quad V(\varepsilon_i) = \sigma_{\varepsilon_i}^2$$

$$E[Q_i/K_i, L_i] = \mu_i = f_i(\cdot) \quad ; \quad V[Q_i/K_i, L_i] = \sigma_i^2 = h_i^2(\cdot) \sigma_{\varepsilon_i}^2$$

$$Q_i \sim (\mu_i, \sigma_i^2)$$

where L_i is the labor allocated to activity i ;

K_i is the capital allocated to activity i ;

$f_i(\cdot)$ is the deterministic part of the production function with production elasticities α ;

$h_i(\cdot)$ is the stochastic element of the production function with elasticities β .

The type of production function has been chosen to follow the function proposed by Just and Pope as we will see in the next section.

The expected profit and the variance of the profit are given as

$$E[R/K, L] = \mu_R = \sum_i E(Q_i/K_i, L_i) = \sum_i f_i(K_i, L_i, \alpha)$$

$$V[R/K, L] = \sigma_R^2 = \sum_i \sum_j h_i(K_i, L_i) h_j(L_j, K_j) \text{Cov}(\varepsilon_i, \varepsilon_j)$$

where R is the revenue from all the agricultural activities.

Following the mean-variance paradigm, the farmer's objective is to minimize the variance of profit generated by his activities subject to a given level of expected profits, all this within the constraints on labor and capital. This is written as

$$\begin{aligned}
 \text{Min}_{K_i, L_i} \quad & \sigma_R^2 = \sum_i \sum_j h_i(L_i, K_i) \cdot h_j(L_j, K_j) \cdot \sigma_{ij} \\
 \text{s.t} \quad & \sum_i L_i = L_0 \\
 & \sum_i K_i = K_0 \\
 & \sum_i P_i^* \cdot f_i(K_i, L_i) = \mu_0 \\
 & j, i = 1, \dots, 6.
 \end{aligned}$$

with $\sigma_{ij} = \text{Cov}(\epsilon_i, \epsilon_j)$

We consider 6 activities: dairy, vegetables, flowers, agrumes, orchard and poultry.

Within this framework of mean variance (M.V.) analysis, the first-order conditions are derived and compared with the first-order conditions of an optimization problem that ignores the impact of risk. The results are given in Table 1.

The main feature of the M.V. model is the price of risk as presented by η . This is the rate of substitution between the level of risk and the level of return resulting from transferring one unit of input from activity i to activity j . This price is equal for all inputs and affects the allocation of inputs among the activities.

From Table 1, it appears that ignoring existing risk when one allocates inputs among production units leads to inefficiency in production since the marginal conditions are not satisfied. To see this, assume a farmer with two activities and one input, capital, such that $K_1 + K_2 = K_0$. The output prices are P_1, P_2 ; ignoring the fact that activity 2 is risky leads to allocating the capital between 1 and 2 following

$$P_1 \cdot MP_{K_1}^\gamma = P_2 \cdot MP_{K_2}^\gamma$$

where $MP_{K_1}^\gamma$ and $MP_{K_2}^\gamma$ are the marginal products of capital in 1 and 2.

But by considering risk in activity 2, the farmer had to use the following condition

$$P_1 \cdot MP_{K_1}^* = \frac{P_2 \cdot MP_{K_2}^*}{\sigma_{K_2}^2 - \lambda_2}$$

where K_1^* and K_2^* are the optimal capital allocation.

Four cases are obtained.

- (i) $P_1 \cdot MP_{K_1}^* > P_1 \cdot MP_{K_1}^{\sim}$ then $K_1^* > \tilde{K}_1$ and $K_2^* < \tilde{K}_2$
- (ii) $P_1 \cdot MP_{K_1}^* < P_1 \cdot MP_{K_1}^{\sim}$ then $K_1^* < \tilde{K}_1$ and $K_2^* > \tilde{K}_2$
- (iii) $P_2 \cdot MP_{K_2}^* > \frac{P_2 \cdot MP_{K_2}^*}{\sigma_{K_2}^2 - \lambda_2}$ then $K_2^* > \tilde{K}_2$ and $K_1^* < \tilde{K}_1$
- (iv) $P_2 \cdot MP_{K_2}^* < \frac{P_2 \cdot MP_{K_2}^*}{\sigma_{K_2}^2 - \lambda_2}$ then $K_2^* < \tilde{K}_2$ and $K_1^* > \tilde{K}_1$

Estimation of Production Functions with Stochastic Specification

The method we have used was developed by Just and Pope who consider a Cobb-Douglas production function with two elements. The first is the deterministic part with the conventional production elasticities α and the second part is the stochastic element who represent the impact of inputs on the spread of output, that is β .

The estimation procedure consists of stages. In the first one, we estimated, by using non linear least squares, the first approximation of α and derive the vector of residuals. This vector is regressed on the inputs by ordinary least squares to obtain the β which, are the elasticities of output variability with respect to inputs. Then by using non-linear weighted least squares (the observations are adjusted by the calculated standard deviation) the correct production elasticities α

Table 1: First-order Conditions of the Two Models

Mean Variance Analysis	Profit Maximization
(1) $\lambda_2 = VmP_{K_i} - \frac{1}{n} \sigma_{K_i}^2 = VmP_{K_j} - \frac{1}{n} \sigma_{K_j}^2$	$\lambda_2 = VmP_{K_i} = VmP_{K_j}$
(2) $\lambda_1 = VmP_{L_i} - \frac{1}{n} \sigma_{L_i}^2 = VmP_{L_j} - \frac{1}{n} \sigma_{L_j}^2$	$\lambda_1 = VmP_{L_i} = VmP_{L_j}$
(3) $\frac{\lambda_2}{\lambda_1} = \frac{VmP_{K_i} - \frac{1}{n} \sigma_{K_i}^2}{VmP_{L_i} - \frac{1}{n} \sigma_{L_i}^2} = \frac{VmP_{K_j} - \frac{1}{n} \sigma_{K_j}^2}{VmP_{L_j} - \frac{1}{n} \sigma_{L_j}^2}$	$\frac{\lambda_2}{\lambda_1} = \frac{mP_{K_i}}{mP_{L_i}} = \frac{mP_{K_j}}{mP_{L_j}}$
(4) $\frac{P_i^*}{P_j^*} = \frac{mP_{K_j} (\sigma_{K_i}^2 - \lambda_2)}{mP_{K_i} (\sigma_{K_j}^2 - \lambda_2)} = \frac{mP_{L_j} (\sigma_{L_i}^2 - \lambda_1)}{mP_{L_i} (\sigma_{L_j}^2 - \lambda_1)}$	$\frac{P_i^*}{P_j^*} = \frac{mP_{K_j}}{mP_{K_i}} = \frac{mP_{L_j}}{mP_{L_i}}$
(5) $\eta = \frac{\sigma_{K_i}^2 - \sigma_{K_j}^2}{VmP_{K_i} - VmP_{K_j}} = \frac{\sigma_{K_i}^2 - \sigma_{K_j}^2}{VmP_{L_i} - VmP_{L_j}}$	

(deterministic part) are obtained. Comparing the results obtained by that procedure with the elasticities obtained from OLS shows the size of the bias which is quite substantial for the dairy. Usually the reverse is obtained. (see Table 2 for details) since production elasticity of labor following the stochastic specification is .98 whereas using OLS it is .17. In the poultry industry, the bias is smaller (see Table 2 of Nimrodi Msc thesis page 50)

Table 2: Production Function Estimates: Dairy

	R^2	No of observations	Labor L	Capital K	Education E	Ordinate
f(.)NLS			.318028 (2.1582)	.972775 (.318028)	.076297 (.7664)	-3.36835 (-2.25013)
h(.)			-.50467 (-1.31517)	1.95429 (4.3505)	.578784 (-1.2949)	-2.52037 (-.60934)
fNGLS	.69927	141	.986527 (6.70213)	.264205 (2.45389)	.199338 (1.5782)	1.88737 (1.79623)
f(.)OLS	.4603	136	.172963 (.950642)	.981477 (4.526)	.147530 (.70639)	-2.86475 (-1.42939)

The function that was estimated is

$$y = e^{\alpha_0} L^{\alpha_1} K^{\alpha_2} E^{\alpha_3} + (e^{\beta_0} L^{\beta_1} K^{\beta_2} E^{\beta_3}) \epsilon$$

where $\alpha_0, \alpha_1, \alpha_2, \alpha_3$ = production elasticities of the deterministic part

$\beta_0, \beta_1, \beta_2, \beta_3$ = production elasticities of the stochastic element.

It is difficult to compare these results with past studies since most of the research did not consider the individual industries as our work. However from Sadan's work one sees that the production elasticity of capital is between .32 and .48 for the industries that was considered livestock. For labor, it was between .65 and .69. In our work we see that the production elasticity for labor is larger and that for capital much smaller (in dairy). The difference between the parameters is rooted also in the fact that the earlier works did not consider the stochastic specification of the production function.

Finally, the hypothesis of constant returns to scale was tested and could not be rejected for all activities. Therefore a model which relates the net revenue per unit of capital to the labor per unit of capital is justified and was used in the final section.

Optimal Diversification of Activities

The analytical model of the farmer's problem is solved with respect to the allocation of inputs. The limitations of the model are partially overcome by the definition of a more practical framework, which is based on constant returns to scale. The decision variables of this model are the amount of labor per unit of capital, which defines the production technology of the activity and the capital invested in the activity as a percent of total capital in the farm, which defines the relative intensity of the activity. The analysis of the net revenue per unit of capital and the risk per unit of capital was performed on a single subset of the sample, since the production function was found to be sensitive to differences in the socioeconomic characteristics. Since every farmer used his own technology of production, the analysis was conducted for three representative levels of technology. In the first part of the analysis, the crops were studied independently of each other. In the second part, the behavior of the farmer is analyzed when he can freely choose his product-mix.

The main conclusion of the first part is that for all technologies the vegetables were found to bring the highest net-revenue per unit of capital, together with the highest risk level, while the dairy farm brings the lowest return with the lowest risk. The main conclusion of the second part is that the correlation coefficients of the various activities were found to be small or negative, which explains why the efficient portfolios include many activities for each return level, and the important amelioration in efficiency brought about by the addition of activities in the portfolio.

The three efficiency frontiers derived from the three representative levels of production technology have shown that at high levels of returns, the level of risk needed to secure a given level of return decreases when the level of technology (amount of labor per unit of capital) increases. The actual position of the farmers in the mean-variance space was compared to the analytic efficiency frontiers with the following conclusions:

- 1) mostly the farmers of the studied subset obey to risk-revenue considerations;
- 2) most of these farmers tend to work at low risk levels at the price of their revenue level, which indicates that they are risk averse.

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Yoav Kislev

Avner Duvdevani

Aspects of Financial Cooperation in the Moshav

Introduction

The moshav is a cooperative village comprising 40-100 farm families, each operating its own farm. Land is national, but the farm enterprises are operated privately. Each farmer in the moshav is a member of the cooperative. Cooperation takes various forms.

The moshav as a unit receives national land and allocates it to the members. Often the cooperative will operate common plots, in addition to land cultivated individually by the members.

The moshav receives factors -- particularly water -- and production quota and allocates them to members.

The cooperative runs the municipal services in the village, street lighting, garbage collection, schooling and similar operations.

The moshav operates service enterprises, such as a machine pool, marketing facilities, a milk collection station.

Perhaps more important than all others, the moshav is a cooperation in finance. The moshav acts as a financial intermediary. The cooperative mobilizes credit from outside and distributes it to members. Marketing is done through the cooperative and debt repayment is, in this way, secured. Most moshavim operate stores for farm supplies and household requisites. Members purchase in these stores on credit increasing, as they do it, their debt to the cooperative. Farm sales reduce the debt.

Financial cooperation also facilitates mutual aid in the moshav. Members in need can apply for financial assistance, to be returned as circumstances change.

Moshavim differ widely in the form of operation and degree of cooperation. As the economic activities inside the moshav, between the cooperative and members, are not regular market operations, they are not recorded in the conventional statistical series and not known. The main purpose of the study reported here is to review financial operations in one single moshav as a first step towards a better comprehension of the moshav's cooperative and its functioning.

1. The Cooperative as a Financial Intermediary

A major function of the cooperative in the moshav is financial intermediation. The cooperative collects credit from external and internal sources and uses this credit for various purposes.

The major target of the credit collected are the members in the moshav in need of financing. The cooperative's advantages in financial intermediation stem from it being close to its members and in a well functioning moshav it will not need formal securities. If the cooperative charges member debtors the market rate of interest, and if it pays member creditors the same rate, it operates just as a financial intermediary -- though perhaps, in the circumstances of the moshav, at a higher level of efficiency than what a bank could have achieved. If, on the other hand, the cooperative charges and pays interest at rates lower than the market rate, it transfers income from member creditors to debtors. If those taking credit are also those in need of assistance at that time, then financial intermediation is also a means of mutual help.

Inflation reduces the real value of both the debts of the members to the cooperative and of their credit. At the same time, debts and credit of others with whom the cooperative works, are also reduced in real terms. We shall attempt to examine the effect of inflation on the value of the financial assets and the liabilities of the cooperative and the functioning of the cooperative as a financial intermediary in an inflationary period. In our discussion we shall

examine three groups: the members, the cooperative, and economic agents exogenous to the moshav. This is a problematic partition, as the cooperative is owned, in the final analysis, by its members. But this partition is very useful for our present analysis.

Review of financial assets and liabilities

Financial assets and liabilities are presented in Table 1 for 1973-79. We did not include in the table real assets, as these are not monetary assets and are not affected by the process of inflation.

In line A.1 we list shares, membership charges and government securities (at cost). In line A.9 we list cost incurred in advance (land preparation for next year's crop, for example). We take these two financial assets as maintaining their real value; that is, as if they were index linked. They are not affected by inflation. Similarly, members' participation in cooperative's capital is not seen in our analysis as a financial liability of the cooperative to the members. This is money that will not be returned and the real value of this item is not affected by inflation.

Generally, inflation reduces the value of outstanding credit. It will therefore affect economic behavior. We shall examine whether inflation affected the behavior of the cooperative; particularly we shall examine the cooperative in 1979 -- the year for which price rise was the fastest.

Consumer price index rose by 92% from September 1978 to September 1979. The management in the cooperative probably tried to adapt its operations to the acceleration of the inflation.

In the last column of Table 1 we list the ratio of the values for the end of 1979 to the values of the same items at the beginning of the year. Members' debt increased by 110%, in real terms they increased by 9.4% ($2.20/1.92$);

Table 1 : Assets and Liabilities of the Cooperative ('000 IL)
End of Year

	1973	1974	1975	1976	1977	1978	1979	<u>1979</u> <u>1978</u>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<u>Part A: Financial Assets</u>								
1. Shares and foreign currency	641	786	982	1,372	2,130	3,072	3,953	1.29
2. Long term credit - to members	1,120	1,353	1,442	2,178	2,652	6,567	16,385	2.50
3. Long term credit - to others	15	10	10	-	150	140	187	1.25
4. Short term credit - to members	2,861	3,242	5,287	5,803	10,690	22,323	44,273	1.98
5. Marketing agencies	422	725	1,187	1,898	3,032	3,148	4,838	1.54
6. Miscellany	373	267	219	379	1,503	3,987	10,041	2.52
7. IOU's	50	-	155	89	-	-	-	-
8. Cash	4	4	96	313	283	159	1,559	9.77
9. Expenditure in advance	-	-	-	-	-	177	-	-
<u>Non-depreciating financial assets (1, 9)</u>	<u>641</u>	<u>786</u>	<u>982</u>	<u>1,372</u>	<u>2,130</u>	<u>3,249</u>	<u>3,953</u>	<u>1.29</u>
Debtors--members (2, 4)	3,981	4,595	6,729	7,981	13,342	28,890	60,658	2.10
Debtors--others (3, 5, 6, 7, 8)	864	1,006	1,667	2,674	4,968	7,434	16,620	2.24
<u>Part B: Financial Liabilities</u>								
1. Proprietorship	619	713	1,324	1,703	3,322	4,645	4,905	1.06
2. Long term liabilities to settlement agencies	991	751	859	793	744	695	646	0.93
3. Long term liabilities to banks	2,440	3,025	3,829	5,555	5,982	9,414	16,445	1.75
4. Long term liabilities--members	34	93	50	521	121	465	925	1.94
5. Others	36	32	71	54	38	1,772	3,506	1.98
6. Short term - members	419	59	2,467	2,940	5,394	1,381	8,825	6.39
7. others	2,999	3,634	4,157	5,373	10,068	31,740	60,499	1.91
<u>Proprietorship (1)</u>	<u>619</u>	<u>713</u>	<u>1,324</u>	<u>1,703</u>	<u>3,322</u>	<u>4,645</u>	<u>4,905</u>	<u>1.06</u>
Liabilities--members (4, 6)	453	638	2,517	3,461	5,515	1,896	9,750	5.28
others (2,3,5,7)	6,466	7,442	8,916	11,775	16,832	43,621	81,096	1.86

but the debts of others increased even faster (124%) -- significantly more than the rise of the price level.

In 1979 the cooperative increased its ability to enjoy a reduction in its debt to members. Such debts (to member creditors) increased by 428%. On the other hand, the debts of the cooperative to exogenous agencies were reduced in real terms -- reducing the basis for inflationary benefits to the cooperative.

The ratio of "members in debt" to "debt to members" was in 1979 6.22. Namely, for every IL 1 the cooperative owes its members, the members owe the cooperative IL 6.22. Debts of members to the cooperative are, therefore, reduced at a faster rate than the debt of the cooperative to the members.

The ratio of "debts of others" to "debts to others" was 1:5. Here the situation is the other way around: for every IL 1 that others owe the cooperative, the cooperative owes IL 5. The cooperative debts to outside agencies are, thus, 5 times larger than its credit and its liabilities are eroded by inflation to a greater extent than erosion of the credit it extended to others.

The effect of inflation

In Table 2, we have tried to assess the effect of inflation, for the period 1974-1979, on the assets and the liabilities of the cooperative -- separately for items relating to members and for items relating to outsiders.

The real value of a financial assets or a liability is changed monthly, according to the monthly price changes. However, complete monthly balance sheets are not prepared in the moshav. We only have annual reports and assume, therefore, as an approximation, that the annual value of the assets and the liabilities of the cooperative were equal to the average of the corresponding beginning of the year and end of the year values (as reported in Table 1).

Table 2 : Inflationary Appreciation of the Cooperative's
Financial Assets ('000 IL)

	1 9 7 4			1 9 7 5			1 9 7 6		
	Appreciation		Average	Appreciation		Average	Appreciation		Average
	Members	Others		Members	Others		Members	Others	
Part A									
Assets									
Members	4,288	-1,181		5,662	-1,566		7,355	-2,011	
Others	935			1,337			2,171		
Total	5,223	-257		6,999	-370		9,526	-593	
Liabilities									
Members	546	150		1,578	436		2,989	817	
Others	6,954			8,179			10,346		
Total	7,500	1,915		9,757	2,262		13,335	2,828	
Net appreciation		1,031		1,658			1,130	1,892	
Part B									
Interest and change in real value	Total in 1974			Total in 1975			Total in 1976		
Interest paid	493			710			1,040		
Of this real (8%)	556			654			828		
Inflationary compensation				-63			56		
Interest charged to members	434			615			782		
Of this real (8%)	299			327			349		
Inflationary compensation		135			288		433		
Appreciation net of compensation		-896		1,721	-842		1,836	-761	
Net appreciation--average per farm	13.3	-14.5		27.8	16.6		30.6	21.0	
Change of price level during year	38%			38.2%			37.6%		
Per farm sales of farm product	183			337			445		
Appreciation relative to sales	-8%	15%		-4%	9%		-3%	8%	

Table 2 (Cont.)

	1 9 7 7			1 9 7 8			1 9 7 9		
	Appreciation			Appreciation			Appreciation		
	Average	Members	Others	Average	Members	Others	Average	Members	Others
Part A									
Assets									
Members	10,662	-2,690		21,116	-7,095		44,774	-21,459	
Others	3,821		-964	6,201		-2,085	12,027		-5,764
Total	14,483			27,317			56,801		
Liabilities									
Members	4,488	1,132		3,681	1,237		5,798	2,779	
Others	14,304		3,609	30,227		10,161	62,359		29,887
Total	18,792			33,908			68,157		
Net appreciation		1,558	2,645		-5,861	8,076		-18,680	24,123
Part B									
Interest and change in real value	Total			Total			Total		
Interest paid	in 1977			in 1978			in 1979		
	2,267			3,886			15,938		
Of this real (8%)	1,144			2,418			4,989		
Inflationary compensation			1,123			1,468			10,944
Interest charged to members	1,747			3,225			12,220		
Of this real (8%)	494			1,395			3,118		
Inflationary compensation		1,253			1,830			9,102	
Appreciation net of compensation		-305	1,522		-4,031	6,608		-9,578	13,174
Net appreciation--average per farm	20.3	-5.1	25.4	43	-67.1	110.1	60	-159.6	219.6
Change of price level during year	33.7%			50.6%			92%		
Per farm sales of farm product	649			942			1,546		
Appreciation relative to sales		-10%	4%		-7%	12%		-10%	14%

In Part A of Table 2 we calculated the change in the value of assets and liabilities. Let us examine the data for 1979. As prices rose during the year by 92%, the value of an asset or a liability of IL 1 at the beginning of the year was reduced to IL 0.52 ($=1/1.92$) by the end of the year. The depreciation in the real value was therefore IL 0.48 ($=1-0.52$) for each IL 1.

The average value of member's liabilities to the cooperative was IL 44,774,000. The depreciation in real value was 48% of this sum which amounts to IL 21,459,000. This is a reduction in the real value of the cooperative's financial assets. On the other hand, liabilities of the cooperative to members (to members with positive balances) was, by our calculation, IL 2,779,000. From the point of view of the cooperative, this sum represents an appreciation in the real value of its financial assets.

This development can be represented from the point of view of the members in the following way: the member debtors (with negative balances with the cooperative) enjoyed a reduction in the value of their debt of IL 21,459,000; the member creditors lost IL 2,779,000. It is also possible that the same member was a creditor for part of the year and a debtor for the rest. This information is not given in the moshav's annual report.

All in all members benefited from price increases: their liabilities to the cooperative were reduced, due to the inflation, by IL 18,680,000. The cooperative also enjoyed a reduction in its liabilities to the outside -- their value was reduced by IL 24,123,000. As in transferring credit, here too, the cooperative acts as an intermediary: it transfers inflationary benefits from the outside agents to the members.

However, the effect of inflation on the value of the assets does not account for all the financial effect, as inflation caused nominal interest rates to

rise. The excess of nominal interest over the real rate is an inflationary compensation the debtor pays to the creditor. In part B of Table 2 we report an attempt to calculate these excesses and to assess, following these calculations, the complete inflationary effects.

The cooperative paid, in 1979, to outsiders IL 15,938,000 as interest. It owed outsiders, on the average, IL 62,359,000. We assume that the real rate was 8 percent. Under this assumption, the amount charged as real interest was IL 4,989,000. The difference, IL 10,949,000, is the compensatory component in the interest the cooperative paid to outsiders. Taking this into account, net depreciation, due to inflation, of the credit the cooperative received from others is IL 13,174,000.

The interest paid by the cooperative to outsiders is covered in two ways: part is charged against services and is realized by the members as cost of production; the other part is charged directly to members. Applying the same kind of calculation, and assuming, here too, that real interest rate is 8%, we found that members enjoyed a net benefit of IL 9,578,000.

Average charges per farm

We examine now the average appreciation per farm. In 1979, the per farm benefits of members against the cooperative was IL 159,600; and of the cooperative vis-a-vis outsiders amounted to IL 219,600.

These data can be looked upon in two ways: one may say that the cooperative transferred to member in 1979 73% of the financial inflationary appreciation it had. From another point of view, the cooperative and the members are one and the same and the benefits of this collective society were IL 219,600 per farm in 1979. Compared to farm revenue, private financial appreciation was 10% of sales, and total benefits was 14% of sales. These amounts are approximately 25% of value added in agriculture in the village..

2. Members' Debt to the Cooperative

The cooperative in the moshav supplies farm services -- it operates a machine pool, a marketing station, a fodder silo, and similar services -- and handles stores for farm inputs and household requisites. All these services do not operate on a cash basis; rather, a member's account is credited when products from his farm are marketed through the cooperative, and the cost of a service or a purchase in the farm store is charged to his account. In this way the cooperative becomes automatically a financial intermediary. As we have seen, the cooperative does more than that -- it goes into the credit market and acts directly as an intermediary.

Most members are debtors -- they have negative balances in the cooperative. In this chapter we report an investigation of the members' debt. The questions we ask are the following.

- a) How did the debt change during the period for which we have data (1973-1981)?
- b) What is the degree of inequality in the distribution of the debt, and did this inequality change over time?
- c) Is the debt distribution stable? Are the same members always the comparatively large debtors, or do we observe members shift positions?
- d) Did the recent acceleration of inflation modify the debt structure in the moshav?

The data we had were monthly short term debt balances of the members in the cooperative for the period 1973-1981. The figures were all deflated by the Consumer Price Index (1976 = 1.00), and annual averages were calculated. Changes in debt during the year -- due, for example, to seasonal factors -- were not examined.

Average Debt and its Change

In Table 3 we report summary data on the debt and farm sales. The data are annual averages per farm in the moshav for the period of observation. Some of the data are also reported graphically in Figure 1.

Average debt decreased from 1973 to 1976 and rose afterwards. Two factors affected changes in the real value of the debt between the years. One is the reduction in the real value of the debt caused by inflation. The other is debt expansion. Inflation was measured as the change in CPI from April to April. Accordingly, we could calculate changes in debt due to each factor separately. Between 1978 and 1979, for example (compare to Table 3):

Rate of inflation	61%
The real value of the debt after price increases ($124/1.61$)	77
Attrition of debt due to inflation ($124-77$)	47
Real expansion of debt ($175-77$)	98

In other words, had not the nominal debt changed, its real value would have been reduced from IL 124,000 to IL 77,000; inflation would have eroded IL 47,000 of the value of the debt. But members expanded their debt -- on the average, by IL 98,000 per farm (in 1976 prices).

In the first three years of the reviewed period, the real expansion of the debt was small; it was significantly larger for the later part of the period.

The data on the inflationary attrition of the debt and on its expansion should be interpreted cautiously. Several factors and considerations are involved here and they can be presented in a discussion of a few cases:

Table 3: Debt and Sales of Farm Products

(Monetary data are in IL'000 of 1976)

	1973	74	75	76	77	78	79	80	1981
Debt per member	139	113	84	81	97	124	175	130	166
Sales per member	335	345	443	445	482	465	428	*	*
Ratio:debt-sales	0.42	0.33	0.19	0.18	0.20	0.26	0.41	*	*
Change of consumer Price index, April- April		0.36	0.43	0.28	0.30	0.54	0.61	1.23	1.34
Value of last year's debt after attrition		102.2	79.0	65.6	62.3	63.0	77.0	78.5	55.6
Inflationary attrition of last years debt		36.8	34.0	18.4	18.7	34.0	47.0	96.5	74.4
Real expansion of debt		10.8	5.0	15.4	34.7	61.0	98.0	51.7	110.4

* Data not available

Figure 1: Lorenz Curves of Debt Distribution

- a) A farmer went into debt to finance an investment project. The project was accomplished and now inflation erodes the real value of the debt. However, to the extent that the nominal rate of interest, charged to the member's account, reflects the rate of inflation, the erosion in the debt will be prevented.
- b) A farm has an average volume of debt associated with the operation of the farm enterprises. An example can be a poultry grower who takes supply on credit from the cooperative's store. Such a farmer will come back and expand his debt in real terms after the reduction caused by inflation.
- c) Income tax consideration made debt expansion desirable from 1979 and on. This issue will not be treated in detail in this report.

Table 3 also lists farm sales, in 1976 prices, this variable rose until 1978 and declined later. We did not separate the changes to real changes in volume of production and to the effect of worsening terms of trade.

Consider the ratio between debt and farm sales. In 1973, debt was 42 percent of the value of sales, this ratio was only 18 percent in 1976 -- it rose again, mostly as debt expanded, but to some extent also as a result of reduction of sales. The relation between debt and sales has more than one dimension: on the one hand a large volume of sales permits repayments of debt; on the other hand, a large volume of sales justifies comparatively large values of debt. The relations between debt and value of sales are of interest when comparing members in the moshav. We shall return to these issues later.

The Range of the Debt and Member Creditors

Had the cooperative in the moshav been operated as a closed economy, disconnected from credit supply of outside sources, then some of the members would have financed the credit to others. That is, member creditors would have

facilitated the negative position of the member debtors. Average debt would then have been zero. It seems, however, that the economic conditions in Israel favor that most farmers will be net debtors. Thus members have negative balances with the cooperative and the village at large owes money to outside agencies. The credit the cooperative mobilizes from the outside is distributed to the members, but unequally. Some members are even creditors with positive balances with the cooperative.

In Table 4 we report selected data relating to the member creditors and the range of the debt (see also Figure 3). The range of the debt is the difference between the highest debt in the village and the lowest debt (the highest positive balance). In the years in which average debt was low, the range was high; the reason is that in those years a relatively large number of members had positive balances with the cooperative.

In the last years, we see a downward trend in the number of member creditors. It may well be that there are no more creditors in the moshav today. This development seems to reflect income tax considerations.

Distribution of the Debt

For the initial presentation of the distribution, we grouped members into 5 groups. There were 12 members in each group. The first group was composed, in each year, of the 12 members in the moshav with the highest debt to the cooperative; in the fifth group -- the 12 with the lowest debt (mostly creditors). In Table 5 we list the share of debt associated with each group each year.

In 1973, for example, the first group had 47 percent of total debt (Table 5B). Had the debt been distributed equally, we would have found each group holding 20 percent of the total volume of debt in the moshav. The findings we report indicate a substantial degree of inequality in debt distribution in the moshav. In 1975, 1976, the first group had 60 percent of the debt.

Table 4: Member Creditors and Range of Debt

(Monetary data in IL'000 of 1976)

	1973	74	75	76	77	78	79	80	1981
Number of members creditors	12	9	14	13	8	8	7	7	1
Percentage of mem- bers creditors	20	15	23	22	13	13	12	12	2
Volume of positive balances in cooper- ative	506	242	458	454	305	381	356	256	2
Average positive balance per member creditor	42	27	33	35	38	48	51	37	2
Range of debt	574	392	693	622	425	525	820	609	542

Table 5: Debt by groups

Table 5A: Debt per member in group (IL'000 of 1976)

	1973	74	75	76	77	78	79	80	1981
Group I	328	253	258	253	243	279	429	342	374
Group II	210	169	123	117	153	192	242	174	193
Group III	140	114	61	60	86	129	146	112	136
Group IV	60	52	15	13	33	55	83	42	89
Group V	(42)	(23)	(37)	(38)	(30)	(37)	(25)	(18)	37
Highest debt	439	314	629	550	333	370	716	483	540
Lowest debt	(135)	(78)	(64)	(72)	(92)	(156)	(104)	(125)	(2)

Table 5B: Debt of group as percent of total debt in Moshav

										<u>Average</u>
Group I	47	45	61	62	50	45	49	52	45	51
Group II	30	30	29	29	32	31	28	27	23	29
Group III	20	20	15	15	17	21	16	17	17	18
Group IV	9	9	4	3	7	9	10	6	11	7
Group V	(6)	(4)	(9)	(9)	(6)	(6)	(3)	(3)	4	(5)

In parenthesis: positive balance

Figure 2: Average debt per member (constant prices)

Figure 3: Average positive balance per member creditor

It seems that in years with low average debt -- its distribution was particularly unequal.

To complete the picture, we report in Table 5A average values of debt per member by group. Again, it is instructive to compare 1975 and 1976 to other years; the debt is low, even for the first group, but it is a comparatively large share of average debt in the village.

The data in Table 5 summarize numerically the degree of inequality in debt distribution in the moshav. A graphical summary is done with Lorenz Curves. Gini coefficients are presented in Table 6. By the table, average difference between any two members in the moshav was, in 1973, IL 37,530. This sum was 27 percent of the average value of the debt in 1973 in the moshav.

Transitions Between the Years

The question of inequality in debt distribution in the moshav is interesting but more interesting is the question of the stability of the distribution, particularly of the ranking, over the years. Three aspects are involved with this issue.

- a) A member with higher debt enjoys comparatively more the services of the cooperative, permanently high ranking of debt means that the same member enjoys for longer periods more services than others.
- b) If the cooperative actually operates to facilitate mutual aid, we should observe help being given in certain years to some members, and in other years -- to other members. A pattern like this should be reflected in members shifting between ranking positions.
- c) Constancy of ranking affects democracy and public decision making in the village. If the same members have always the highest debt they will vote with their own interest in mind (for lower internal rates of interest, for example). If ranking positions shift often, members may vote more with

Table 6: Average difference in debt between 2 members

(IL'000 of 1976)

	73	74	75	76	77	78	79	80	1981	Average
Average difference in debt	37.5	28.1	29.8	29.4	28.2	32.5	45.6	35.8	32.8	34.5
As share of average debt	.270	.248	.355	.361	.290	.363	.260	.275	.198	.280

general welfare considerations in mind.

One simple way to examine this problem is to calculate the average group position of each member for the examined period. Such information is given in Appendix Table 1. If ranking were to change randomly, average group position of all members would have been 3.0.

Another way to examine the same problem is to look at a transition table. In Table 7A we exemplify transitions from 1973 to 1974. Averages are reported in Table 7B. On the average, 64 percent of the members who were classified in any one year to the first group stayed with the first group in the following year, 23 percent moved to the second group, 7 percent to the third group, and so forth. In general, members stay in the same group or in neighbouring positions, between successive years.

In Table 8, we report the same information for transitions from the beginning of the observed period to its end; that is, from 1973 to 1981. Table 8 indicates many more transitions than did Table 7. However, a close examination still reveals that a comparatively large number of the members that had higher debt at the beginning of the period also were relatively large debtors toward its end.

Table 7: Transitions between groups in successive years

Table 7A: Numbers moving from group to group between 1973 and 1974

		<u>1974</u>				
		I	II	III	IV	V
1973	I	9	2	1	0	0
	II	2	5	3	2	0
	III	1	2	5	3	1
	IV	0	3	3	3	3
	V	0	0	0	4	8

Table 7B: Transition between successive years, average per period (percent)

	I	II	III	IV	V
I	64	23	7	4	1
II	26	38	22	22	4
III	4	23	32	26	11
IV	3	9	23	27	34
V	2	3	12	33	46

Table 8: Transitions between groups

1973-1981

Table 8A: Numbers moving between groups

1973-1981

1981

		I	II	III	IV	V
	I	4	4	3	1	0
	II	2	2	3	4	1
1973	III	2	1	2	6	1
	IV	4	2	1	0	5
	V	0	3	3	1	5

Table 8B: Transitions between groups

1973-1981 (percent)

		I	II	III	IV	V
	I	33	33	25	8	0
	II	17	17	25	33	8
	III	17	8	17	50	8
	IV	33	17	8	0	42
	V	0	25	25	8	42

Appendix Table 1

Average group position of members' short run debt to the cooperative

ID.	MEMBER	B1	B0	76	7A	77	76	75	74	73	MEAN
1	42	1	1	1	1	1	1	1	1	1	1.0
2	26	1	1	1	1	2	2	2	1	1	1.4
3	32	1	2	1	1	1	1	2	1	1	1.4
4	5	1	1	?	1	1	1	2	1	3	1.4
5	34	2	1	1	1	2	2	1	2	2	1.6
6	39	1	1	1	2	3	3	2	1	2	1.8
7	24	1	1	1	1	1	1	4	2	4	1.8
8	45	1	1	1	2	1	2	2	2	4	1.8
9	46	1	2	4	4	1	1	1	1	1	1.8
10	49	4	2	?	2	1	1	1	1	2	1.8
11	19	2	2	?	2	3	3	1	1	1	1.9
12	30	2	2	?	3	3	2	1	1	1	1.9
13	2	1	2	?	1	2	2	2	3	2	1.9
14	17	2	2	?	1	1	2	3	4	3	2.2
15	41	3	5	1	4	1	1	1	1	1	2.2
16	16	4	2	?	2	1	1	3	3	3	2.3
17	25	5	3	?	2	2	2	1	2	2	2.3
18	20	1	1	1	1	2	3	5	3	4	2.3
19	1	2	1	2	3	2	2	2	4	4	2.4
20	10	1	1	1	5	5	1	2	3	3	2.4
21	55	?	3	3	2	3	4	3	1	1	2.4
22	22	?	5	5	4	3	1	1	1	1	2.6
23	35	3	3	2	2	2	4	1	2	4	2.6
24	54	1	3	1	2	2	3	4	3	1	2.6
25	11	1	3	4	3	4	3	3	1	1	2.6
26	4	3	2	?	2	3	4	5	2	1	2.7
27	6	5	4	3	2	1	2	3	2	3	2.8
28	50	3	5	4	5	2	1	1	2	2	2.8
29	14	2	1	1	1	4	3	4	5	5	2.9
30	56	2	1	?	3	4	4	5	4	2	3.0
31	23	3	3	4	3	3	5	3	2	2	3.1
32	29	4	3	1	3	3	3	3	3	3	3.1
33	51	4	3	1	4	4	3	3	2	2	3.1
34	27	3	5	1	2	3	2	4	4	3	3.2
35	21	3	2	1	3	5	5	3	3	2	3.2
36	60	5	4	5	4	1	1	2	3	4	3.2
37	59	5	3	4	3	3	2	1	4	5	3.3
38	31	1	5	3	1	2	5	5	5	4	3.4
39	48	5	2	1	1	3	4	5	5	5	3.4
40	3	4	5	5	4	4	3	2	3	2	3.6
41	13	2	2	3	5	5	3	4	4	4	3.6
42	56	3	4	5	5	2	2	2	4	5	3.6
43	15	3	3	3	3	5	4	5	4	3	3.7
44	38	5	4	4	3	2	3	4	4	4	3.7
45	36	2	3	4	5	5	4	3	4	5	3.9
46	52	4	5	4	5	4	4	4	2	3	3.9
47	53	5	4	1	3	5	5	3	3	4	3.9
48	12	4	5	5	5	4	4	3	3	3	4.0
49	40	4	3	3	5	5	4	4	4	5	4.1
50	43	5	4	5	4	4	3	2	5	5	4.1
51	57	2	4	4	4	4	5	4	5	5	4.1
52	47	4	5	5	4	5	5	4	4	2	4.2
53	37	4	4	5	4	4	4	5	5	3	4.2
54	14	4	5	5	5	5	5	4	3	3	4.3
55	28	5	4	4	4	5	4	5	5	4	4.4
56	7	5	5	4	3	5	5	4	5	4	4.4
57	8	3	4	5	5	4	5	5	5	5	4.6
58	9	5	4	4	5	4	5	5	5	5	4.7
59	10	5	5	5	4	3	5	5	5	5	4.7
60	33	3	5	5	5	5	5	5	5	5	4.7

3. Average and Marginal Rate of Interest

The value of short run debt of members to the cooperative constitutes between 20 - 40 percent of the value of sales in the moshav, depending on the years. In the previous chapter we considered debt distribution; in the present chapter we shall take up the issue of the rate of interest the cooperative charges its members. Particularly, we shall compare the possibility of charging the marginal rate of interest to the current procedure in which members are charged the average rate. As the short run debt is not index linked, the rate of interest also reflects rate of price changes and it has reached recently, 8 percent per month. The volume of debt and the interest charged are major economic magnitudes in the moshav.

Interest in the Moshav

The cooperative charges members the average rate of interest. At the beginning of each year, the cooperative estimates interest payments it will make to outside agencies. Members are charged the average estimated rate. Members with positive balances are credited at the same rate. Accurate calculations are made at the end of the year. In this way, the cooperative follows, in fact, the patronage principle.

In addition to charging members directly, the cooperative also charges interest to its service enterprises -- machine pool, marketing -- and these are paid by the members utilizing the services. We shall not consider these charges in our discussion.

The rate of interest the cooperative pays to outside lenders is rising with the volume of debt. Limited amounts can be mobilized at comparatively low rates; however, for larger amounts the cooperative has to pay higher rates. As a result, average rate is lower than the marginal. Generally, the differences were comparatively small, but recently they increased. For 1981, for example, the average monthly rate was 7 percent, while the marginal rate was 9.6 percent. On the annual basis -- the average was 125 percent and the marginal was approximately 200 percent.

Marginal Rate

It is often said that charging members the average rate of interest reduces efficiency in the moshav and the members should be charged the marginal rate. The reason being that as the member expands his debt, he causes the cooperative to expand its debt to outsiders and the cost to society is then the marginal rate of interest.

Charging the marginal rate raises two difficulties. The first is that such charges will reduce mutual aid in the moshav. If in reality aid is mostly financial, then if members are charged the marginal rate they pay the "commercial" price per credit and no aid is present. Two remarks can be forwarded in relation to this argument:

- a) The rate of interest the cooperative pays, even the marginal rate, can be expected to be lower than the rate a member facing financial difficulties would have to pay if he were not a member in the moshav.
- b) The differences between the marginal and the average rate is a function of the rate of inflation. One wonders whether a system in which aid is not explicitly decided upon, but is determined by exogenous factors such as the rate of inflation is at all justified.

The second difficulty associated with marginal charging is that it causes the cooperative to collect from members more than the sums it pays to its outside lenders. One may think of three ways in which excess charges can be returned to members:

- a) Reimbursement proportional to the debt. This is patronage and members will take the consequences of the policy into account and operate as if they paid the average, not the marginal rate.
- b) Equal reimbursements -- each member will receive the same amount.
- c) Reimbursements as a function of an economic variable that is independent of the debt. A good candidate could be marketing through the cooperative. As the higher the volume of cooperative marketing, the more the cooperative can mobilize comparatively low - rate credit.

The operations we now consider are conducted in the books -- not as cash transfers. Different charges and methods of reimbursement may affect the size of the debt and its distribution. We shall therefore examine, for the moshav we work with, what would have been the effect of different charges and reimbursements.

The Moshav's Data

We list in Table 9 data on debt and sales in the moshav for the years 1974 - 81. The data are averages per member. Also included in the table are a few calculations we performed. As the marginal rate we took the interest rate the cooperative paid to the regional buying organization. In general, the marginal rate was higher than the average; an exception was 1979. The largest difference was in 1981. The marginal rate exceeded the average by 62 percent.

Table 9: Short run debt, interest under
alternative methods and farms sales
(current prices, IL'000)

	1974	75	76	77	78	79	80	81
1. Average debt per member	46	49	62	99	193	426	700	2,104
2. Maximum positive balance	28	38	60	94	223	291	752	13
3. Maximum negative balance	131	377	425	349	575	1,803	2,790	6,874
4. Coefficient of variation of debt	0.87	1.45	1.45	1.05	0.92	0.99	1.08	0.71
5. Rate of interest charges to members	24%	24%	26%	35%	35%	60%	96%	125%
6. Marginal rate	26%	26%	27%	40%	45%	58%	153%	202%
7. Average Monthly charge	0.84	0.870	1.154	2.417	4.718	15.607	38.295	137.667
8. Average monthly charge according to marginal rate	0.923	1.006	1.359	3.054	6.742	17.925	70.649	300.841
9. Average reimbursement	0.102	0.136	0.205	0.637	2.024	2.318	32.753	163.175
10. Average farm sales	183	306	397	603	713	1,423	3,759	7,652
11. Standard deviation of sales	127	146	215	286	452	784	1,759	4,539
12. Coefficient of variation of sales	0.69	0.48	0.54	0.47	0.63	0.55	0.47	0.59

As mentioned, charging and crediting is done in the books. As a result, the value of the debt in each member's account reflects interest charged according to the current method. We had to correct by deducting from the recorded debts the amounts due to interest and recalculate interest according to the alternative method.

In line (7) in Table 9 we report per member charges according to the average rate and in line (8) -- according to the marginal rate. As an example, examine the data for 1981. Per-capita charges according to the average rate were then IL 137,667. If calculated according to the marginal rate, members would have been charged IL 300,841. Reimbursement is IL 163,175 per capita. This amount can be repaid to members either in identical payments or according to farm sales. It is interesting to note that differences in farm sales between members are smaller than differences in debt (compare line (12) to line (4) in Table 9). This fact will affect equality of debt distribution under the different methods.

Debt Distribution

Our analysis is conducted under the assumption that members would not have changed their financial behavior had the cooperative shifted to alternative interest charges. This assumption was basic for the calculations in Table 9, 10, 11.

Two factors determine the effect of the modification in the charging methods:

- a) The degree of equality in debt distribution. If members hold identical debts, then charging the marginal rate and reimbursements in equal sums per member will not modify the distribution.
- b) The correlation between debt and sales.

In line (1) of Table 10 we report correlation between debt and sales. In most years it was negative and often low.

In Table 11 we report average differences as a measure of inequality (absolute Gini coefficients). Consider 1981. The Gini coefficient in Table 11 for charges according to the average rate (the current method) was IL 850,151; for charges according to the marginal rate -- it would have been IL 1,318,324 or IL 1,308,607, depending on the reimbursement method adopted.

Table 10: Coefficients of Correlation and
relative capability

	1974	75	76	77	78	79	80	81
1. Correlation between debt and sales	.141	-.087	-.135	-.089	-.285	-.303	-.123	.200
Coefficient of inequality								
2. Debt with average rate	.501	.735	.750	.597	.528	.545	.599	.404
3. Debt with marginal rate and identical reimbursments	.502	.726	.734	.588	.509	.519	.557	.407
4. Debt with marginal rate and reimburs- ment proportional to sales	.501	.726	.734	.588	.510	.520	.559	.404

Table 11: Average differences
(IL'000)

	1974	75	76	77	78	79	80	81
Coefficient of inequality								
5. Debt with average rate	23	36	46	59	102	232	420	850
6. Debt with marginal rate and identical reimbursments	24	37	48	63	110	247	507	1,318
7. Debt with marginal rate and reimbursments proportional to sales	25	37	48	63	110	247	509	1,309

4. Short Run Credit and Other Economic Variables

The current, short-run credit of the member to the cooperative is a stock variable that changes daily. It is affected by real activities; purchased inputs, sales of farm products, consumption outlays; and by financial activities: receiving or repaying credit.

An important determinant is the rate of interest. In inflationary periods, nominal interest rates are high, and the interest paid (or charged in the moshav) is the major determinant of the debt. But on this score one should distinguish between the debt measured in nominal value and the debt measured in real value. In an inflationary period, and in the absence of indexation, interest payments correct, at least partly, for the reduction of the real value of the debt as prices rise. Therefore, if the debt is examined in real terms, the interest charged is much less important than for the debt in nominal terms.

The real activities affect the debt directly as each is recorded in the member's account in the cooperative's books. Financial operations are more complicated. As a member receives a loan from an outside agency, the sum is credited to his current account. According to the schedule of payments, the member is charged periodically on the appropriate dates. These charging dates may differ from the dates at which the loan is repaid to the outside lenders -- by accelerating repayments the cooperative mobilizes financial resources for its own operation.

Most loans are linked to prespecified projects. As raw material or equipment is purchased, the appropriate sums are charged to the member's account.

More often than not farmers are debtors. The basic reason is macroeconomic: Farm firms utilize in their economic activities savings accumulated by households, rural and urban. In Israel the government is also involved in the capital market and capital is also imported from outside.

An interesting question is what determines the size of the debt? Will a large farm carry a larger debt than a small farm? Is the current debt associated with investment? Do certain farm types tend to carry higher debts than others? We shall attempt to deal with some of these questions in this chapter.

Correlations

We report in Table 12 several major economic magnitudes for 1973-1982, per farm. The major point reflected in the Table: sales of farm products and outlays in constant prices did not change much during the period, but their changes, and particularly their relative changes, created two distinct periods as regards farm surplus: 1974-77 and the more recent period. Changes in per farm debt, again in constant prices were larger than changes of sales but these were also not very large changes.

Averages hide differences between the members. To some extent, such differences are reflected in the correlation coefficients reported in Table 13.

In general, we see a negative correlation, though small in magnitude, between debt and farm sales. Debt was also negatively correlated with farm expenditures in 4 out of the 8 years in Table 13. Even with regard to investment the picture is mixed. Debt in year t and debt in year $t-1$ are strongly correlated.

The conclusions the reader can draw from Table 13 are that farmers do not change often the level of their real debt; a farm with a comparatively large debt this year will also tend to have a large debt in the next year; there

Table 12: Debt, Farm Sales, Expenditures and Investment per Farm

(IL '000)

	1973	74	75	76	77	78	79	80	81	82
1. Debt, nominal prices	42	46	49	62	99	193	426	700	2,104	3,661
In March 1976 prices										
2. Debt	139	113	84	81	97	124	175	130	160	138
3. Farm Sales	-	296	423	337	383	301	313	357	339	-
4. Farm Expenditures	-	198	304	246	269	307	277	259	318	-
5. Farm Investment	-	35	42	110	38	77	27	13	10	-
6. Farm Surplus	-	98	119	91	114	-6	36	98	21	-

Note:

- Not available.

Table 13: Correlation coefficients between debt and other economic variables

(Calculated in March 1976 prices)

	1974	75	76	77	78	79	80	81
1. Farm Sales	.116	-.080	-.130	-.095	-.286	-.290	-.107	.200
2. Farm Expenditures	.148	.151	-.029	-.145	-.043	-.049	.060	.262
3. Debt in Previous year	.820	.690	.813	.675	.499	.616	.788	.727
4. Farm Investment	.065	.224	.247	.017	.212	-.052	.028	-.198

is no clear and strong association between volume of debt and size of farm operation, whether measured from sales side or from expenditures; investment also does not affect the debt consistently.

The negative conclusion, on the absence of clear cut effects, drive us to treat the relations between the debt and other variables in more detail in the next section of the chapter.

Regressions

In Table 14 we report regression estimates attempting to explain the determinants of the debt. To discuss the meaning of the findings we examine the regression for 1976.

Debt in 1976 is correlated with debt in 1975. The regression coefficient is 0.803 -- for any additional IL 1 in 1975 there will be IL 0.803 in the 1976 debt. Or, to see it from the other side -- IL 0.197 ($=1-0.803$) is repaid. Similar findings are reported for all the years in the table. The average for the period is a repayment of IL 0.312 ($1-0.688$) in year t for any IL 1 in year $t-1$.

Farm sales reduce debt. In 1976 by IL 0.362 for every IL 1 in farm sales. Farm expenditures increase debt -- in 1976 by IL 0.448 for every IL 1 of expenditures. In general, sales and expenditures affect the debt in opposite directions but in similar magnitudes.

The meaning of these coefficients is that the cooperative grants credit for the purchase of inputs through the cooperative stores which amounts (on the average for the period) to 36.4 percent of the year -- approximately 4 months. The cooperative also keeps the revenue it collects for the sale of farm products on the members account for approximately the same period of time.

Table 14: Regressions

	1974	75	76	77	78	79	80	81	74 -77 pooled average for period
1. Debt previous year	.614 (11.10)	.719 (6.30)	.803 (13.18)	.599 (6.86)	.582 (4.84)	.875 (6.34)	.621 (10.73)	.692 (7.98)	.681 (17.40)
2. Farm Sales	-.043 (.97)	-.323 (2.93)	-.362 (3.68)	-.060 (.62)	-.372 (3.80)	-.856 (4.65)	-.332 (3.13)	-.307 (1.49)	-.144 (3.60)
3. Farm Expenditures	.141 (1.68)	.320 (2.46)	.448 (3.40)	-.007 (.05)	.259 (3.05)	.974 (4.64)	.352 (2.78)	.428 (2.16)	.182 (3.37)
4. Farm Investment	.192 (.99)	.231 (1.41)	.444 (3.30)	.182 (1.08)	-.226 (.78)	-.374 (.96)	.277 (.84)	.439 (.58)	* .146
5. Intercept	6.14 (.36)	32.5 (1.16)	8.23 (.49)	66.2 (2.68)	117.0 (3.29)	77.5 (1.97)	45.0 (1.75)	39.1 (1.57)	28.5 (2.66)
6. R ²	.699	.558	.786	.475	.424	.576	.705	.604	.569

Notes

* Not included in the regression

Members in the moshav often mobilize long run credit to finance investment projects on their farms. The investment coefficient in Table 14 indicates the financial support in short run borrowing through the cooperative. In 1976, for example, short run credit -- from current financing -- supported investment projects at the rate of IL 0.444 for every IL 1 invested. Average for the period was 0.146. In other years the investment coefficient was negative. In those years (1978 and 1979), it seems that long run credit exceeded actual outlays on investment projects.

The Effects of Inflation on Capital Formation
in a Moshav 1970/71-1979/80

by

Yoav Gal and Pinhas Zusman

1. Introduction

A moshav is a farming community in which all farms are family owned and operated, and all farmers are organized in a village level multi-purpose service cooperative -- the association. Beside purchasing farm inputs for members' use and marketing their outputs, the association also serves as the sole financial intermediary through which credit is being channeled to members. The association usually owns and operates a variety of service facilities such as water supply installations, farm implements, sorting and packing sheds, storage facilities, etc. It may also manage directly some jointly operated production activities, such as citrus orchards, cotton fields, etc. The relationships between the association and the individual members are varied and highly developed, and as it turns out, highly sensitive to inflationary effects.

Rates of price inflation in Israel during the 70's were high and rapidly rising - from an annual rate of 12% in 1970/71 to an annual rate of 124% in 1979/80. Such developments in the economic environment, in which farmers operate, must have had a marked impact on their performance. The objective of this study is to trace out some particular inflationary effects; namely those affecting capital formation in a Moshav; and while we focus on a particular Moshav -- Ein Ha'Teva¹⁾ it is plausible to expect the findings to hold true for many Moshavim, especially those featuring a similar farm organization.

In the capital formation process resources are mobilized and invested. The two main sources for investment funds are savings and loans. The determinants and pattern of saving in a moshav are especially interesting, since this is the sole source of equity capital. However, borrowing is still a principal source of funds. By definition investment is the process of increasing capital stocks -- fixed and current, and acquiring financial

assets. Both will be explored in the present study.

The methodology employed in the present analysis deals with village aggregate and not with individual family farms. To this effect, an accounting system based on the national accounts conventions was adapted to data obtained from the association records.²⁾ It was, thus, possible to derive such aggregate measures as village gross product, village consumption and savings, village investment, etc, all analogous to the corresponding measures used in national accounts. The Village figures were broken down into three principal sectors: a) Members' farms, b) The association, and c) The municipality. The first and third sector, respectively are analogous to the private and public sector ordinarily distinguished in the national account system. The second sector may be regarded as a "public business sector" similar in many ways to the publicly owned industries in some western countries. This breakdown provides insight into the differential effects of inflation on the principal components of the Moshav, and on the interrelation among them. In the present study we ignore the municipality.

In the following, the inflationary process in Israel during the 70's is described and its possible effects in the Moshav, as predicted by economic theory, are considered. The aggregative data pertaining to capital formation are then presented in two ways - first the standard presentation consisting of pure flow variables; and second, the effects of inflation on the valuation of stock variables is analyzed. It turns out that the discrepancies between the two sets of measures is of primary importance during an acute inflation, such as that witnessed in Israel during the 70's.

2. The Inflationary Process in Israel in the Decade 1970/71-1979/80 and its Possible Effects on the Moshav

a. Price inflation in Israel 1970-1980/81

The inflationary process in Israel during the decade 1970/71-1979/80 is described by the price indices presented in Table 1 and the annual rates of change in the consumer price index (CPI) presented in Table 2.

Table 1: Price Indices - 1970/71-1980/81

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Consumer Price Index	100.0	113.0	132.1	176.8	253.4	330.0	439.5	653.4	1070.6	2393.0
Output Price Index (Ein Ha'Teva)	100.0	106.5	133.0	173.6	248.6	322.1	393.1	578.6	923.6	1835.0
Agricultural Input Price Index	100.0	114.8	131.1	186.8	295.0	386.8	503.6	755.0	1219.2	2854.2
Terms of Trade Index (Ein Ha'Teva)	100.0	93	101	93	84	83	78	77	76	64

Source: CPI and input price index from CBS sources. Ein Ha'Teva output price index was calculated from specific output price indices available in the CBS sources; using Ein Ha'Teva average output mix.

Table 2: Annual Rates of Change in the Consumer Price Index
1970/71-1979/80

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Annual Rates of Change in CPI	12.0	13.0	17.0	33.8	43.3	30.3	33.2	48.7	63.8	123.5

Thus, the average annual rate of inflation as measured by the CPI during the decade 1970/71-1979/80 was 42% -- a very high rate indeed. Furthermore, inflation accelerated during this period from a low rate of 12% per annum, at the early 70's to an annual rate of 124% at the end of the decade. As is also evident from Table 1 price changes during the decade were not purely inflationary, but also involved significant changes in relative prices. In particular, the terms of trade experienced by farmers in Ein Ha'Teva worsened considerably during this period, so that by 1979/80 the relevant index stood at 64% of its 1970/71 level.

Not surprisingly nominal interest rates, though not the real rates, charged to members in Ein Ha'Teva increased markedly during the decade -- from 13% per annum in 1970/71 to 53% per annum in 1979/80 (Table 3). As is evident from Table 3, despite their rapid rise, nominal rates of interest lagged appreciably behind inflation, thus giving rise to negative real rates of interest. The acuteness of this phenomenon became more pronounced as inflation accelerated reaching a real rate of interest of -31.5% in 1979/80, when inflation rate amounted to 124%, annually. It should be noted that the figures reported in Table 3 are aggregates over all loans. There existed, however, a marked difference between interest rates on different loans. Thus, long term institutional credit involved much lower nominal rates of interest.

b. Possible effects of inflation on the Moshav

What were the likely effects of inflation on the moshav economy? In the following we consider several possible effects suggested by economic theory. The analysis will ignore changes in relative prices that accompanied the inflationary process, but will take into account the dynamics of interest rate adjustment to the rise in price levels during the analyzed period as exhibited in Table 3. We shall also consider influences exerted by the accounting practices in the cooperative association and the taxation structure in Israel during the period.

Table 3: Nominal and real annual rates of interest
Ein Ha'Teva, 1970/71 - 1979/80

(In %) *

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Nominal rate, members	13.4	10.3	24.0	9.7	12.3	16.1	10.7	17.9	38.5	53.0
Real rate, members	1.3	-2.4	6.0	-18.0	-21.6	-10.9	-16.9	-20.7	-15.4	-31.5
Nominal rate, association	4.3	4.5	6.5	6.1	11.0	15.6	18.2	35.6	66.2	116.1
Real rate, association	-6.9	-7.5	-9.0	-20.7	-22.5	-11.3	-11.3	-8.8	1.5	-3.3

* Average over all loans.

- (1) Real interest rate effects. As is evident from Table 3 real interest rates during the decade were mostly negative or positive and very low, especially with regard to long term institutional loans. This, no doubt, enhanced farmers willingness to invest through long term borrowing from institutional sources, which in turn led to the tight rationing of this type of credit. Hence, apart from a negligible income effect of the low institutional rate, it was not likely to affect saving behavior. However, since short term credit was less subject to rationing, low real rates of interest, and in particular,² negative rates, on short term debt tended to encourage investment and borrowing and to depress saving.
- (2) Cash flow effects. Inflation may tighten farmers' cash flow positions in two important ways. First, as prices rise, the nominal funds required to bridge over consecutive harvests increases -- a direct price effect. Secondly, the increase of nominal rates of interest due to high inflation rates in effect accelerates real loan repayment (see Section 10), and increases the need for more frequent refinancing -- the indirect effect. The cash flow effects, therefore, tend to depress investment.
- (3) Cost accounting distortions. Owing to the legal demands of the fiscal authorities and to considerations of technical convenience the cooperative association records are based on historic cost accounting. As is well known historic cost accounting is subject to severe distortions under inflationary conditions. In particular, the balance sheet value of capital goods and depreciation costs are underestimated so that the profitability of capital intensive productive activities is overrated. Also, since nominal rates of interest are high and the balance sheet value of capital goods, in real terms, depreciates rapidly, the association charges for services rendered to members is distorted over time. That is, under full cost pricing ("patronage"), the capital cost component in the prices that the association charges its members is overestimated in the early years of the asset's life cycle. A distortion in the time profile of members' utilization of the association services is thus created. Furthermore, if members' price elasticity of demand for the association services is less than unity,

the association enjoys an accelerated pay back of its investment in service facilities.

- (4) Taxation effects. Since interest payments are deductible expenses, high nominal rates of interest along with higher share of debt financing contribute to a lower tax burden. Conversely, high equity financing reduces the farmers' tax deductability. Hence, both farmers and the cooperative association would opt for a higher share of debt financing during a period of high inflation, placing their equity capital in appropriate "tax shelters".
- (5) Debt erosion effect. As indicated earlier, inflation erodes the real value of unlinked debt balances. In equilibrium, the lenders are, of course compensated by correspondingly higher nominal rates of interest. This was already mentioned as a factor contributing to a tighter cash flow position. Another manifestation, yet, of this relation is in the way available real funds are utilized. In particular, both farmers and the cooperative association are more likely, under these circumstances to increase the share of real debt repayment and lower the share of investment in physical capital goods.

4. Income, Consumption and Savings (Historic Cost Accounting) Ein Ha'Teva 1970/71 - 1979/80

a. Moshav Ein Ha'Teva

In the rest of this report aggregative data pertaining to moshav Ein Ha'Teva will be presented and analyzed. It is appropriate, therefore, to provide first a short description of this farming community.

Ein Ha'Teva is one of the oldest moshavim in Israel, where the majority of farmers are second and third generation, and only a minority are new settlers. The cooperative association and the municipality in Ein Ha'Teva are well organized, and the economy of the moshav is highly developed. The main production branches, in order of importance are: dairy cows, poultry, sheep, olives, citrus orchards, and vegetables. Due to the preponderance of milk production in Ein Ha'Teva, marketing is almost fully controlled by the association.

The settlers in Ein Ha'Teva are well educated and experienced farmers. Solidarity among members of the moshav is high, and moshav cooperative ideology plays a prominent role in peoples' views. Members are, therefore, inclined to participate in collective action and to abide by the community cooperative regulations.

b. Income, consumption and savings of the members sector

The pattern of income, consumption and saving of the members' households sectors in Ein Ha'Teva, 1970/71 - 1980/81 is presented in Table 4. The figures are not adjusted for inflationary debt erosion.

Several points in Table 4 are worth noting. First, due mostly to the worsening terms of trade during the analyzed period, the gross village product generated in the members' sector declined steeply. Partial compensation by transfer payments from the association to its members ⁴⁾ did not alter this general trend appreciably. The consequences are reflected in the members' disposable income. Yet, despite the marked decline in members' income during the decade, consumption kept rising, so that household saving, which had been relatively high during the early 70's, kept falling, becoming virtually negative in the last three years. The income-consumption pattern exhibited by the household sector in Ein Ha'Teva suggests that, under moshav condition the link between income and consumption is greatly weakened ⁵⁾. Consumption followed an autonomous path, which appears to depend more on the overall consumption levels in the Israeli society, than on households income in the moshav. This behavior is sustained, and possibly even encouraged, by the availability of short term credit, which cuts off the otherwise close link between disposable income and consumption. A common practice in moshavim, which was also employed in Ein Ha'Teva during the analyzed period, is to allot each family a monthly "consumption credit allowance". The size of the allowance, which depended on the member's family size and not on his income, was decided by the association's executive committee in accordance with current consumption standards in the Israeli society at large.

The implication of this pattern of behavior is that members propensity to save in Ein Ha'Teva depended on the income differentials between Ein Ha'Teva and the rest of the country. When the differentials move in favor of Ein Ha'Teva saving rates rise rapidly, and conversely, when they move against Ein Ha'Teva, as it

Table 4: Gross Product, consumption and saving of the members'
households sector, Ein Ha'Teva 1970/71 - 1979/80
(Millions IL., 1979/80 Prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Members gross village product	54	34	64	68	55	58	54	27	36	-8
+ Transfer payments from the association to members	13	11	5	6	1	2	3	-4	10	19
= Members' personal gross income	66	45	69	74	56	59	57	23	46	11
- Members income taxes	7	7	9	9	9	9	8	10	14	12
- Municipal taxes	3	4	4	4	3	4	3	4	3	2
= Members disposable gross income	56	34	56	61	45	47	46	9	29	-3
- Members' Consumption	21	21	26	27	22	24	32	30	39	25
= Members' gross saving*	35	12	31	33	22	22	14	-21	-9	-28

* Discrepancies are due to rounding off.

happened in 1970/71 - 1979/80.

Members average propensity to save out of their personal gross income during the entire decade was 22% -- somewhat lower than the national average of 24% during the same period ⁶⁾. Members' propensity to save out of their gross disposable income was, of course, much higher -- 29%.

c. The association saving behavior 1970/71 - 1979/80

Households are not the only source of saving in Ein Ha'Teva. The cooperative association also contributes to village saving through the creation of undistributed surpluses. The association saving behavior during the analyzed period is presented in Table 5.

Examining Table 5 it is noticed that, apart from the year 1974/75, the association's gross product fluctuated about 22.1 million IL out of which it saved 7.3 million IL, i.e., 33%. Since annual members' gross saving amounted to 11.1 million IL, total village saving during the analyzed period added up to 18.4 million IL of which roughly 60% originated in the household sector and 40% in the cooperative association. The latter was, thus, a major contributor to saving in Ein Ha'Teva.

5. Capital Formation (Historic Cost Accounting), Ein Ha'Teva 1970/71 - 1979/80

a. The capital formation process

The capital formation process, as viewed in the present study may be identified with the process of change over time in the principal constituents of the village balance sheet -- both assets and liabilities. That is, the village saving along with long term and short term loans provide the funds required for investment in the various capital assets. Our classification of assets, however, is somewhat different from the one ordinarily used in conventional accounting systems.

Table 5: The association's gross product and saving,
1970/71 - 1979/80 (Million IL., 1979/80 prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Association gross village product	23	21	19	17	10	17	22	23	26	22
- Salaries of local employees	4	4	5	5	5	5	6	8	8	10
- Transfer payments to members	13	11	5	6	1	2	3	-4	10	17
- Housing services, association	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
= Gross saving, association	5	5	9	5	3	10	12	19	7	-6

b. Capital formation in the members' household sector

Annual figures pertaining to capital formation in the members' households sector in moshav Ein Ha'Teva are presented in Table 6.

Examining Table 6 it is noticed that about 53% of the funds available to members during the decade were invested in the farm; the rest was directed mostly to non-farm investment, such as housing and the expansion of the association equity capital. Only a minute share (5%) of the available funds was used by members to increase their credit balances with the association.

The funding of members' gross investment originated from several sources. Gross members' saving provided about one quarter of total funding, while about one half of it was raised by increasing members debt; most of it short term. "Errors and omissions" is a residual error item accumulated in the estimation process. It is fairly sizeable since several independent sources of data were tapped.

The annual series presented in Table 6 do not exhibit any distinctive pattern. Variation in all series are fairly big. Even excluding the first and last year extreme figures, annual variation is wide -- $\pm 25\%$ of the average. In particular notice the spurt of investment in the association equity in 1978/79.

c. Capital formation in the cooperative association

Capital formation in the cooperative association is described by the data presented in Table 7.

The role of the cooperative association as a financial intermediary is clearly evidenced by the data in Table 7 -- over two thirds of its investment was financial, mostly in the form of credit to members. The rest was used for investment in the association's fixed assets and stocks. About 45% of the resources raised by the association were in the form of equity, or long term debt. This was mostly invested in physical fixed and long term financial assets (mainly participations in regional secondary cooperative associations).

Table 6: Capital formation in the members' households sector
Ein Ha'Teva, 1970/71 - 1979/80
(Millions IL, 1979/80 Prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	Total	%
<u>Members' investment:</u>												
Farm investment	9	29	21	28	20	20	29	37	18	6	217	45
Non farm investment	6	1	10	12	10	13	9	12	8	6	88	19
Increase in value of livestock	7	11	17	3	-2	7	-2	1	8	-1	48	10
Increase in members credit balances	4	-1	5	3	7	2	10	-1	-5	0	24	5
Members' contribution to assoc. equity	6	7	5	6	7	7	6	13	35	8	98	21
Total investment	31	47	57	52	41	50	52	61	65	18	475	100
<u>Members' sources:</u>												
Members' gross saving	35	12	31	33	22	22	14	-21	-9	-28	110	23
Increase of short term debt	-12	19	6	4	10	17	-2	42	29	37	151	31
Increase of long term debt	-0.5	1	2	2	0	0.5	2	8	24	-0.5	38	8
Errors and omissions	8	16	20	13	10	10	38	32	21	10	176	38
Total sources	31	47	57	52	41	50	52	61	65	18	475	100

Table 7: Capital formation in the cooperative association,

Ein Ha'Teva, 1970/71 - 1979/80

(Millions IL, 1979/80 prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	Total	%
<u>Association investment:</u>												
Fixed capital	9	5	10	6	13	5	6	27	25	9	116	23
Long term financial investment	4	5	5	4	5	4	4	10	8	17	66	13
Long term loans to members	-0.5	-1	2	2	0	0.5	2	7	24	-0.5	37	7
Changes in inventory	2	-2	5	2	6	3	4	16	6	3	45	9
Increase in members short term debt	-12	19	6	4	10	17	-2	42	29	37	151	30
Increase in other receivables	4	1	3	5	7	18	13	2	10	23	86	17
Miscellaneous	1	0	-0.5	1	-1	1	1	-1	3	3	9	1
Total association investment	8	28	30	25	40	48	30	104	106	92	510	100
<u>Association sources:</u>												
Increase in long term debt	3	3	10	8	5	6	6	9	16	43	108	21
Increase in current liabilities	-1	15	15	8	26	33	14	79	51	39	279	55
Members' and other contributions to equity*	1	4	-3	3	5	0	-2	-3	31	17	53	10
Association's saving	5	5	9	5	3	10	12	19	7	-6	70	14
Total association sources	8	28	30	25	40	48	30	104	106	92	510	100

* This line item represent discrepancies in the accounts due to two independent sources of data. It consists mostly of members contribution to the association equity listed in Table 6.

Consequently, credit extended by the association to its members had to be drawn from short term loans, and was, therefore, conducive to an increase in members' current indebtedness to the association. The association's role as a financial intermediary was, thus, limited to the provision of short term credit. Members had to rely on outside sources, chiefly government, as a source for long term loans.

d. Village saving and investment

Table 8 provides a consolidated summary of the capital formation process in Ein Ha'Teva for the entire decade. Thus, in the analyzed decade, village saving accounted for a little more than one quarter of total resources available for village investment (or one third, if "errors and omissions" are ignored). The rest was financed by outside capital -- mostly short term loans. The major part (77.5%) of the available resources was invested in capital goods, the rest was invested in various financial instruments and receivables. The growth of Ein Ha'Teva's economy is thus crucially dependent on the continuous infusion of outside capital, with the concomitant weakening of the village financial position. Nevertheless, this situation is alleviated significantly if one takes into account the inflationary debt erosion.

6. Inflationary Debt Erosion in Ein Ha'Teva 1970/71 - 1979/80 --
The Effects on Gross Product, Consumption and Saving

a. The inflationary debt erosion process and its measurement

The term debt erosion, as used in the present study, refers to the fall of the real value of the outstanding debt balances due to the rise in the general price level. This applies, of course, only to loans not linked to any price index. Linked loans are not eroded. As is well known, high inflation rates are accompanied by high nominal rates of interest, which lead to high current interest charges. Under historic cost accounting the latter are treated as an ordinary cost item, thus leading to the under-estimation of profits. Depreciation charges, on the other hand, distort the profitability calculation in the opposite direction. In the following we focus on the measurement of

Table 8: Capital formation, Ein Ha'Teva village consolidated accounts

Total 1970/71 - 1979/80

(Millions IL, 1979/80 prices)

Source/investment	Value	%
<u>Village sources:</u>		
Gross saving	180	26.7
Increase of long term debt	108	16.0
Increase of short term debt	255	37.8
Errors and omissions*	132	19.5
Total sources	675	100.0
<u>Village investment:</u>		
Increase in fixed assets	421	62.4
Long term financial investment	66	9.8
Increase in inventories and livestock	93	13.8
Increase in receivables	86	12.7
Miscellaneous	9	1.3
Total village investment	675	100.0

* "Members' and other contribution to equity" of Table 7, and "Members' contribution to the association's equity" of Table 6 were added and subtracted, respectively, from "Errors and omissions".

profits and debt erosion in a firm without fixed assets. Consider a firm owning inventories and denote its annual nominal sales by S , its nominal annual purchases of inputs by C , and its nominal interest charges, paid throughout the year, by R . Suppose, further, that the firm does not amortize its loans during the year, neither does it borrow any additional funds. It does, however, pay its creditors all interest accruing on the outstanding loans. Consequently, the firm's nominal debt balance does not vary over time. We also assume that inventories are currently revaluated and the surplus cash income $S-C-R$ is withdrawn from the firm.

The firm's nominal balance sheet at the beginning of the year is then

<u>Assets</u>	<u>Liabilities</u>
Inventories V_0	Net worth K_0
	Loans B_0
<hr/> Total assets V_0	<hr/> Total liabilities $K_0 + B_0$

Its end of the year nominal balance sheet is

<u>Assets</u>	<u>Liabilities</u>
Inventories V_1	Net worth K_1
	Loans B_1
<hr/> Total assets V_1	<hr/> Total liabilities $K_1 + B_1$

Let p_0 and p_1 , respectively denote the prices ruling at the beginning and end of year, and $\bar{p}$ the average annual price.

The firm's true profit, π , is defined as the maximal sum of money that could be withdrawn from the firm without lowering its real net worth. Hence, using the balance sheet identities and the fact that the nominal debt does not change (i.e., $B_1 \hat{=} B_0$), the profit in average prices is:

$$\begin{aligned}
 (1) \quad \pi &= S - C - R + (\bar{p}/p_1)K_1 - (\bar{p}/p_0)K_0 \\
 &= S - C - R + (\bar{p}/p_1)(V_1 - B_1) - (\bar{p}/p_0)(V_0 - B_0) \\
 &= S - C - R + (\bar{p}/p_1)V_1 - (\bar{p}/p_0)V_0 + (\bar{p}/p_1)(1 - p_1/p_0)B_0
 \end{aligned}$$

Note that S, C, and R are spread over the year and need no revaluation. The contribution of inflationary debt erosion to profit is, therefore, equal to $(\bar{p}/p_1)(1 - p_1/p_0)B_0$. Recall that under inflationary conditions R is also higher. Ignoring inflationary debt erosion and treating full interest payment as a cost item, as the practice is under historic cost accounting, is, therefore, conducive to underestimation of income and saving. However, should the firm own fixed capital, the underestimation of depreciation operates in the opposite direction, i.e., the profit is exaggerated.

b. Inflationary debt erosion in Ein Ha'Teva

Although both members and the cooperative association in Ein Ha'Teva owned fixed capital assets, there is no need to consider the accounting distortions due to the inflationary underestimation of depreciation under historic cost accounting. This is because the present analysis is couched in terms of "gross", rather than "net", figures. Inflationary debt erosion figures were obtained by applying the "debt erosion factors" $(\bar{p}_t/p_t)(1 - p_t/p_{t-1})$ to the members and the association overall average net debt balances in each year. Here $\bar{p}_t$ and p_t , respectively, denote the average and end of year price levels. Numerical values of the debt erosion factors are listed in Table 9. The average net debt balances and the estimates of inflationary debt erosion figures are presented in Table 10.

Table 9: Inflationary debt erosion factors 1970/71 - 1979/80

Year (t)	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
$(\bar{p}_t/p_t)(1 - p_t/p_{t-1})$	0.083	0.091	0.180	0.316	0.323	0.258	0.257	0.392	0.601	0.816

Table 10: Inflationary debt erosion, Ein Ha'Teva
1970/71 - 1979/80 (Thousands IL, 1979/80 prices)

	Members average net debt	Members' debt erosion	Association average net debt	Association debt erosion
1970/71	32,740	2,717	35,610	2,957
1971/72	30,837	2,806	31,144	2,834
1972/73	34,468	6,204	28,196	5,076
1973/74	29,150	9,211	23,947	7,568
1974/75	26,256	8,481	22,521	7,274
1975/76	29,180	7,258	18,912	4,880
1976/77	23,332	5,996	11,741	3,018
1977/78	31,961	12,529	14,662	5,747
1978/79	42,103	25,304	15,923	9,570
1979/80	37,911	30,935	24,274	19,808
Total Debt Erosion		111,711		68,732

As inflation rates rose during the analyzed period, so did the debt erosion factors. By 1979/80 over 80% of the debt, which was entirely unlinked, was eroded annually. This compares with about 8% in 1970/71. It is evident from Table 10 that despite intensive borrowing during the decade the overall village net debt level (in constant prices) actually declined. That is, the steep reduction in the association's real net debt was only partially compensated by the moderate rise in the members' real net debt. Comparing Tables 4 and 5 to Table 10 it is immediately obvious that the omission of inflationary debt erosion creates unacceptable distortions, since both product, income and saving are badly underestimated.

c. Members' gross product and saving accounts corrected for inflationary debt erosion

Members' gross product income, consumption and saving adjusted for debt erosion are presented in Table 11. Comparing Table 11 with Table 4 it is found that correcting the members' village gross product and income for debt erosion leads to a substantial increase in their values. The corrected figures are more in line with each other, and are in general much more plausible, although the overall declining trend has not been reversed. It is also obvious that apart from 1977/78, positive (corrected) saving persisted and it was far more stable. Members' average propensity to save out of their disposable income, during the analyzed period, corrected for debt erosion, amounted to 0.46, exceeding substantially the uncorrected propensity to save (0.29). Note **also** that during 1976/77 - 1979/80, when inflation rates accelerated appreciably, saving rates fell steeply. However, in view of the discussion in section 4.6., it is doubtful that a direct causal relationship between saving and inflation rates is thereby indicated. There is clearly no evidence that inflation enhances saving, even though debt erosion is increased.

d. The association's product and saving accounts corrected for debt erosion.

The association gross product and saving corrected for debt erosion is described in Table 12.

Table 11: Members' product and saving accounts corrected for inflationary debt erosion, Ein Ha'Teva, 1970/71 - 1979/80 (Million IL, 1979/80 prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Members' gross village product	56	37	70	77	63	65	60	40	61	22
+Transfer payments from assoc. to members	13	11	5	6	1	2	3	-4	10	19
=members personal gross income	69	48	75	83	65	67	63	36	71	42
-members taxes	10	11	13	13	12	13	11	14	17	14
= Members' disposable gross income	58	37	63	70	53	54	52	22	55	28
- Members' consumption	21	21	26	27	22	24	32	30	39	25
= Members gross saving	37	16	37	43	30	30	20	-8	16	2

Table 12: The association gross product and saving corrected for inflationary debt erosion, Ein Ha'Teva, 1970/71 - 1979/80 (Million IL., 1979/80 prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Association gross village product	26	23	24	24	17	22	25	29	36	42
- Salaries of local employees	4	4	5	5	5	5	6	8	8	10
- Transfer payments to members	13	11	5	6	1	2	3	-4	10	19
- Housing services, association	1	1	1	1	1	1	1	1	1	1
Association gross saving	8	8	14	13	11	14	15	25	17	14
Propensity to save out of gross village product	.31	0.35	0.58	0.54	0.65	.64	0.60	0.85	0.47	0.33

Comparing the uncorrected gross product and saving figures in Table 5 to the corrected ones in Table 12, it is immediately evident, that inflationary debt erosion was a major contributor to the association gross saving. In fact it doubled it. Furthermore, if one ignores 1979/80, when large transfer payments were made, it would appear that the association's propensity to save out of its product, corrected for inflationary debt erosion, tended to rise with inflation rates, contrary to the observed behavior of members' households. In explicating this interesting finding one must refer to the heavy reliance of decision making in the cooperative association on the formalities of the accounting system. Since historic cost accounting is a mandatory requirement of the fiscal authorities, and since no parallel "inflation accounting" system has been devised and used in Ein Ha'Teva (or for that matter in any other moshav), it is not surprising that inflationary debt erosion was ignored by the cooperative association. Apparently, the inflationary under-estimation of depreciation charges was smaller than the association's inflationary debt erosion, so that members were "overcharged" for the association's services, including debt services.

7. The Effects of Inflationary Debt Erosion on Capital Formation in Ein Ha'Teva, 1970/71 - 1979/80

a. The general effects of inflationary debt erosion on capital formation

In the preceding sections inflationary debt erosion was portrayed as an implicit part of the gross product, income and saving, thus contributing to the sources of investment funds. In the historic accounting system, debt erosion is manifested as a reduction in the real value of the members' and association's outstanding net debt. Consequently, the "sources" components comprising increases in the short and long term debt balances are, thereby, diminished. It follows that the investment part of the capital formation table is essentially unaffected by inflationary debt erosion⁷⁾. The following analysis will, therefore, deal exclusively with the "sources" part of the capital formation table.

The sources of funds invested by the members and the cooperative association in Ein Ha'Teva are presented in Table 13.

Table 13: Sources of investment funds corrected for inflationary debt erosion.

Members and association, Ein Ha'Teva, 1970/71 - 1979/80
(Millions IL., 1979/80 prices)

Year	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	Total
<u>Sources, association</u>											
Association's gross saving	8	8	14	13	11	14	15	25	17	14	139
+ Increase in association net	-1	16	19	9	24	34	17	82	58	61	318
+ Members' contribution to equity capital	1	4	-3	3	5	0	-2	-3	31	17	53
Total sources, association	8	28	30	25	40	48	30	104	106	92	510
<u>Sources, members:</u>											
Members' gross saving	37	15	37	43	30	30	20	-8	16	2	222
+ Increase in members' net debt	-14	16	1	-3	1	10	-6	38	28	6	76
+ Errors and omissions	8	16	20	13	10	10	38	31	21	10	177
Total sources, members	31	47	57	53	41	50	52	61	65	18	475

Comparing the figures in Table 13 to those in Table 7, one notices that the increase in the association's uncorrected total gross saving from 70 million IL. to a corrected figure of 139 millions IL. was associated with a corresponding reduction in the association's debt financing. Members' sources were affected in a similar manner. Their uncorrected gross saving was increased from 110 to a corrected level of 222 million IL. This was accompanied by an equal reduction in their debt balances ⁸⁾. In absolute terms, the effects of inflationary debt erosion on members was more substantial than the corresponding effect on the association.

To analyze the overall effects of inflationary debt erosion on the sources of investment funds in Ein Ha'Teva during the analyzed period sources are consolidated in Table 14.

Table 14: Consolidated village sources for investment corrected
for inflationary debt erosion, Ein Ha'Teva. total
1970/71 - 1979/80 (Millions IL. 1979/80 prices)

Source	Value	%
Gross village saving	361	53.5
Increased village debt	181	26.8
Errors and omissions*	133	19.7
Total sources	675	100.0

* "Members' and other contributions to equity" of Table 7 and "Members contribution to the association equity" of Table 6 were added and subtracted, respectively, from "Errors and omissions".

Comparing Table 14 to Table 8, the role of inflationary debt erosion stands out immediately. Gross saving now becomes the principal source of investment funds -- accounting for 54% of total village sources. This compared to 27% before correction. The difference is taken up by increases in debt, which now accounts for only 27% of total village sources, as compared to 53% before correction.

How had inflationary debt erosion affected the level and composition of capital formation? On the basis of a priori considerations one would expect overall investment to decline when inflation rates are high. This is because high nominal rates of interest induced by high rates of inflation imply a faster loan repayment and an increased need of refinancing. This should have led to less reliance on borrowing as a source of investment funds. However, the expectations are not born out by the data, since both investment and borrowing in the second half of the decade, when inflation rates were higher, actually expanded. The explanation of this behavior is, apparently, provided by the strongly negative real rates of interest during the second half of the analyzed decade. Credit rationing does not seem to have formed a sufficiently stringent constraint on the availability of investment funds.

8. Concluding Remarks

The salient features of the capital formation process in Ein Ha'Teva during the years 1970/71 - 1979/80 were: (i) a steep decline of the village gross product due to worsening terms of trade; (ii) negative real rates of interest, which encouraged borrowing and investment and might have depressed saving; and (iii) high levels of inflationary debt erosion. Since members' consumption displayed an autonomous pattern of behavior, the decline of gross product implied low, and at times even negative, levels of saving out of current income. This was compensated, to a large extent though not fully, by inflationary debt erosion.

Overall, moshav members seem to have benefited from the inflation. This was essentially due to the lag in the adjustment of nominal rates of interest to the accelerating inflation, which mitigated the harmful affects of continuously deteriorating terms of trade, and contributed to farmers income and saving under, otherwise, adverse conditions.

Footnotes

- 1) The name of the Moshav adopted in this report was changed in order to protect its true identity. A brief description of Ein Ha'Teva is provided in section 4.a.
- 2) A presentation and discussion of the approach is provided by Gal (1983).
- 3) All figures presented in this report pertain to the "agricultural year" (October through September) and not to the calendar year.
- 4) Transfer payments from the cooperative association to its members consist of surpluses generated in the jointly operated branches.
- 5) Similar results were reported by Arbel (1973).
- 6) Calculated from annual gross saving rates given in The Bank of Israel Annual Report, 1981, (Table B-13, p. 31).
- 7) Since all long term financial assets owned by the members and the association are linked in some form, inflationary debt erosion of these assets is negligible.
- 8) Discrepancies between association's and members' changes in saving and changes in debt are due to accumulated round-off errors.

References

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e. Cooperation

The U.S. cooperator, Joseph D. Reid, Jr., of the Center for Public Choice (formerly at V.P.I., currently at George Mason University), visited Israel in the summer of 1982. This opportunity was used for thorough discussions of the subject matter of the project. Professor Reid was subsequently consulted by mail and phone and helped substantially with his comments and suggestions.

f. Benefit to Agriculture

The investigations carried out under this project constitute a milestone in that they pioneer an in-depth look into the problematics of the moshav cooperatives, which comprise a plurality of Israel's farmers. Deeper understanding of how cooperatives function and what conflicts beset them is desirable everywhere, since agricultural cooperation is pervasive and takes many forms. In Israel such understanding is particularly important, since the vast majority of family farming is organized in cooperatives.

The studies reported here focus on the conflicts generated by the moshav cooperative in its role as a financial cooperative and its role as a financial intermediary between the members of the cooperative and the outside world. There is reason to believe that the financial functions of the cooperative, besides its marketing functions, constitute the major source for potential troubles. Hence, any light shed on this aspect of the moshav is potentially beneficial.