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Government Credit Programs: Justification, Benefits, and Costs

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Subsidized credit programs for agricultural producers have often been used to boost production in less developed countries. The "traditional" views in support of this policy instrument, as summarized by von Pischke, Adams, and Donald (1983), are that credit programs are easier to implement than such policies as land reform or infrastructure development, that subsidized credit can offset the negative impact on farm income and disincentives of government policies such as overvalued exchange rates and price controls, and that credit programs are necessary to provide capital for adoption of new technology. The informal credit market moneylenders are considered monopolistic, exploitive, and antidevelopmental, and incapable of providing the necessary credit.

Considerable opposition to the traditional view has developed. Critics claim that credit programs are not essential to adoption of new technology because most innovations can be adopted piecemeal rather than all at once, that informal moneylenders perform legitimate economic functions, that high interest rates are primarily caused by high opportunity and risk costs, and that subsidized formal market interest rates cause rationing of credit to rich farmers, discourage mobilization of rural savings, and cause a misallocation of funds to lower-payoff investments.

Based on this critique, von Pischke, Adams, and Donald recommend a shift from subsidized supply-oriented credit programs to efforts oriented toward market integration and savings mobilization with interest rates determined by market forces.

In this chapter, the determination of interest rates and the supply of funds in informal agricultural credit markets is explored in order to assess the conditions which might justify supply-oriented credit programs. The benefits and costs of a Philippine government credit program are then examined as an illustrative case study. The chapter concludes with general observations on the possible role of government in agricultural credit markets.

INTEREST RATE DETERMINATION

Interest rates in informal rural credit markets are typically much higher than those in institutional markets. In the Philippines, for example, informal money interest rates vary from 30 percent to more than 100 percent, with median rates of 45 to 50 percent. Institutional rates in the agriculture sector range from 16 percent to 20 percent. Analyses of interest rate determination in informal markets have concluded that risk premiums, opportunity costs, and high costs of administration account for much of the high interest rates, but generally some degree of monopoly rent has been found. Monopoly power has been variously attributed to institutional factors, such as the social and economic power exercised by landlords over tenants, and market imperfections, such as the domination of local markets by monopolists.

An interpretation of the source of monopoly rent in informal market interest rates which is more fruitful in assessing the likelihood of success of government intervention in agricultural credit markets has been presented by Virmani (1982). In competitive equilibrium, the interest rate on loans must be such that the expected returns to the lender are equal to the total cost of the loanable funds:

(1) $E(L) = (1 + r)(1 - p)L + pC = (1 + i + t)L$

or

(2) $r = (i + t + p - pC/L)/(1 - p)$,

where $E(L)$ is expected returns to the lender, L is loan size, r is loan interest rate, p is probability of default of borrower, i is opportunity cost of funds to lender, t is transaction costs of lending, and C is collateral on loan.

The competitive equilibrium interest rate is a function of the opportunity cost of funds to the lender, the transaction cost, the probability of repayment of the loan, and the amount of collateral on the loan. If loans are made with collateral, the equilibrium interest rate is less. From the standpoint of the expected return to the lender, interest and collateral are substitutes. It is possible to obtain a given expected return on a loan by different combinations of interest rate and collateral (Binswanger and Rosenzweig 1982; Stiglitz and Weiss 1981; Virmani 1982).

This framework is useful for identifying the source of monopoly power in informal credit markets. Assume initially that borrowers intend to pay back loans, so that any default is involuntary, caused, for example, by crop failure. In a competitive environment with perfect information, each lender's estimate of p (the probability of default) for any given borrower should be identical. However, it is reasonable to expect that each lender, or potential lender, will have different subjective estimates of the probabili-

ties of default due to differential access to information regarding the borrower; the less information the lender has about the borrower, the higher his subjective estimate of the probability of default. From equation (2), the higher the estimate of the probability of default p, the higher is the interest rate which must be charged. (See Virmani for a formal presentation of these axioms.)

The lender with the most information can charge the lowest interest rate. He need not charge the rate which equalizes his own marginal costs and returns, but rather can charge just under the rate which would be charged by the lender with the next-best information. Information thus serves as a barrier to entry of other lenders. One major source of monopoly power of the traditional moneylenders is the information generated from long-term personal, social, and economic contacts with local borrowers.

The second, closely related source of monopoly power is that the moneylender will have lower transaction costs for both delivery and collection of loans than do potential competitors because of long-term experience with borrowers in his locality. However, he can charge a rate that exceeds his transaction costs because of the higher transaction costs of potential new lenders in the locality.

DISCRETIONARY DEFAULT

The preceding assumes that default occurs only when the borrower is unable to pay due to crop failure or other adverse circumstances. However, borrowers may choose not to repay even though it is feasible. Binswanger and Rosenzweig (1982) point out that borrowers seeking to maximize utility will default if the penalty from default, arising from loss of future earnings and collateral, is less than the value of repayment plus interest.

The possibility of discretionary default strengthens the ability of the lender with the closest information links to the borrower to extract monopoly profits through high interest rates. In addition to a better subjective estimate of the probability of nondiscretionary default, this lender, through his relationship with the borrower, can enforce a lower rate of discretionary default. Consequently, he can charge an interest rate with a premium for both higher subjective probabilities of nondiscretionary default and higher rates of discretionary default facing potential competition. The implications for government credit programs are discussed below.

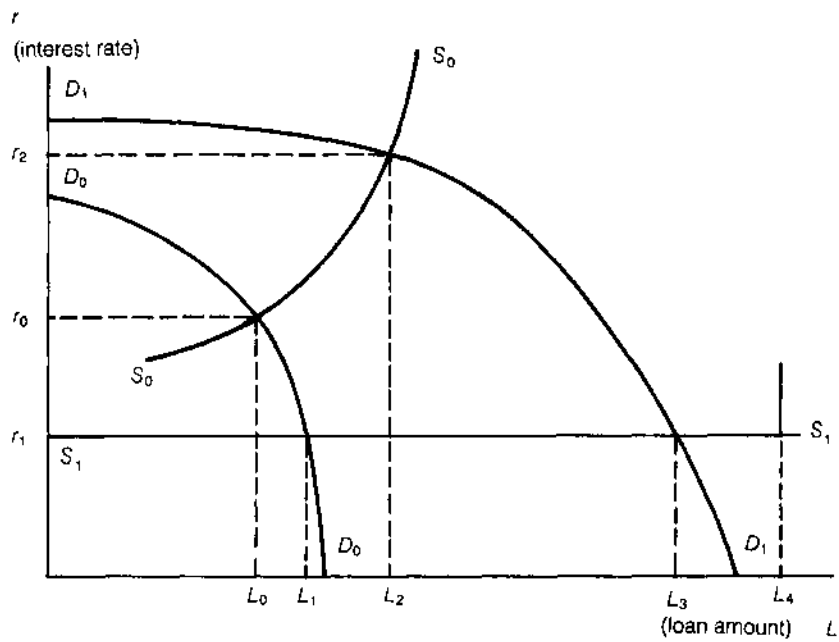
SUPPLY OF FUNDS IN INFORMAL CREDIT MARKETS

Empirical evidence on the supply of credit from informal sources in rural areas is limited. Available evidence, however, indicates that it is probably almost adequate for static traditional production technology but inade-

quate to finance optimal levels of input and production following introduction of new production technology (Rosegrant and Herdt 1981). The conceptual framework in chapter 10 above supports this view by emphasizing the role of capital constraints in slowing the rate of growth that can be achieved from technological change.

Figure 13.1 shows the impact of the informal market loan constraint on borrowings following the introduction of new technology. Let S_0S_0 be the supply curve for credit to a farm from the informal credit market as a function of the interest rate. Although the shape of this curve is not well established in the empirical literature, it is generally agreed that the curve is rather sharply upward-sloping, with the interest rate offered increasing with the amount of the loan. A number of factors may contribute to this relationship. First, following the simple model of discretionary default, the probability of default (in the absence of collateral) will increase for any borrower as the amount of the loan increases because of the increase in the benefits of default. Second, the proportion of potential defaulters in the mix of borrowers tends to increase as the amount of the loan goes up. They tend to seek larger loans and to consider riskier investments. Conse-

Figure 13.1 Credit supply and demand as a function of interest rates in informal and institutional markets, with and without modern production technology



quently, the interest rate to all borrowers increases to compensate for a higher proportion of risky loans. Third, as loan size increases the opportunity costs of funds to the moneylenders will tend to increase.

Assume that the government institutes a credit program (or subsidizes private banks) which will provide credit up to the amount L_4 at the interest rate r_1. The supply schedule for institutional credit is thus given by S_1S_1. The impact of this credit program on the amount borrowed, and therefore on input use and production, is highly dependent on whether or not there is modern productive technology available.

Figure 13.1 shows two different demand schedules for credit, D_0D_0, which represents the demand for credit for traditional technology (such as traditional rice varieties), and D_1D_1, which is the demand for credit to be utilized for modern technologies (such as fertilizer-responsive rice varieties). The curve D_0D_0 is assumed to be highly inelastic because the response of credit demand to changes in interest rates is limited by the low productivity of inputs to be financed with the credit.

Introduction of new technology, which has inputs of much higher marginal productivity, shifts the credit demand curve to the right. At any interest rate, more credit will be demanded relative to the traditional technology case. The demand curve for credit for new technology is shown as first having a fairly elastic segment, then becoming progressively more inelastic, with a quite inelastic segment around the interest rate offered under the government credit program. This representation of the demand curve is derived from the simulation analysis for the Philippines presented below.

The figure shows that if only traditional technology is available the impact of the credit program on loan amount (and therefore on production) is small (the shift from L_0 to L_1). The main effect of the program is to transfer income to borrowers due to the reduction in the interest rate from r_0 to r_1. Following the introduction of new technology, the government credit program can have a substantial impact on the amount borrowed, as shown by the shift from L_2 in the informal market to L_3 in the credit program, and therefore on input use and production.

Figure 13.1 indicates that a shift to the right of the supply curve in the informal market (S_0S_0) after the introduction of new technology would increase the income of lenders in this market. This shift does not occur or occurs very slowly, primarily because lenders in the informal market generally lend out of their own equity and do not acquire deposits from outside sources. Therefore, the supply curve can shift only with increases in lender equity. Such increases may occur over time with increases in income from the loan business (and other enterprises of informal lenders such as rice milling and input supply) due to the new technology. But the response will be slower and smaller than if lenders also generated loans from deposits.

Binswanger and Rosenzweig point out two reasons for the dependence on equity in informal credit markets. The first is the seasonality and timing of the loan/production process. With both depositors and lenders involved in agricultural production, withdrawal of depositor funds for production purposes will coincide with borrowing. Therefore, the lender cannot utilize the deposits to finance loans. Second, yield covariance causes covariance of default risks and covariance of incomes among depositors and borrowers. Crop failure can result in depositors' withdrawing deposits because of low incomes at the same time that borrowers are unable to repay loans. A lender who lends out of deposits may be unable to reschedule loans, and instead may have to liquidate loans at a loss to cover deposit withdrawals.

Little or no empirical research has been done on the source of funds for moneylenders, but the broad picture presented above is generally accepted. However, it is possible that lenders may be able to expand their operations by drawing on funds from the national banking system (and thus avoid the covariation problem). Proposals for governments to provide funds for informal lenders have been made but not adopted. The Philippine Masagana 99 program, in which the government injects funds directly into the rural bank system, is a variant of these policies.

IMPLICATIONS FOR GOVERNMENT CREDIT PROGRAMS

The way in which informal agricultural credit markets set interest rates and supply funds has a number of implications for government credit programs which attempt to reduce interest rates and increase the supply of credit in these markets.

The availability of productive technology is essential for a credit program to have a significant impact on borrowing, input use, and production. Subsidized credit will have little impact on production characterized by static traditional technology because the quantity of credit supplied by informal sources is adequate, or nearly so. With static technology, the only justification for subsidized credit is to eliminate the monopoly rent (if any) in interest charged by moneylenders and thus to increase the incomes of farmers. Even in this case, the subsidies required to induce institutional lending in agriculture may be too high to be justified. The benefits will exceed the costs only if modern production technology is available and utilized.

The belief that physical fragmentation of rural credit markets is the source of monopoly rent has often led to an underestimation of the costs of intervening and to simplistic assumptions that introduction of institutional credit will provide the competition to reduce interest rates. The alternative framework here indicates that interest rates are a function of the opportu-

nity costs of funds, the probability of default, transaction costs, and collateral. The sources of monopoly rent are differential access to information and different transaction costs among lenders. The lender with the best information links and the most efficient delivery and collection can charge an interest that just covers the higher estimated probability of default and higher transaction cost of the next-best lender. This prevents other lenders from entering the market.

Compared to informal lenders, institutional lenders (either government agencies or banks) typically have much poorer access to information and higher transaction costs in the agriculture sector. In urban areas, institutional lenders have better information access and lower transaction costs than in rural areas. Yet most government agricultural credit programs have sought to induce institutional lending to farmers at interest rates at or below urban rates. To accomplish this, the government must compensate the institutional lender for its high probability of default and transaction costs by reducing the opportunity cost of funds below the opportunity cost in the urban market. This can be done, for example, by permitting rediscounting of agricultural market loans at the central bank at preferential rates.

A further cost of effective government intervention into the rural credit market is discretionary default. Government lending programs often result in making default attractive to borrowers. To some extent this is unavoidable, since most programs attempt to reach small farmers with no collateral, so the probability of default will be higher than for loans to farmers with collateral. The lack of information and high transaction costs in collections further increase the probability of default. Attempts at sanctions against default are usually ineffective because farmers often assume that they will be permitted back into the program after a brief lapse of time or that the program will be discontinued. In each case, the expected loss of future earnings due to default is much reduced.

Because of these problems, institutional development should be a major component of any government credit program. Government subsidies on lending to rural markets are probably necessary in the early stages of intervention into the market, even to maintain interest rates at the same level as urban rates. This is because new lenders in the rural market lack information collection and processing capability and have high transaction costs. However, these subsidies tend to substitute for institutional development unless efforts are made to develop the information collection and processing and general management abilities of the institutional lenders and to reduce default probabilities and transaction costs. In the long run, such development can reduce rural interest rates, and subsidies relative to urban rates can be phased out.

SUBSIDIZED AGRICULTURAL CREDIT IN THE PHILIPPINES

Assessment of the benefits and costs of the Masagana 99 credit program reinforces the points made above. The impact of the program, begun in the Philippines in 1973, on farmer input use, yield, and income is examined using a multi-season farm decisionmaking model incorporating stochastic production technology, risk-neutral and risk-averse decision rules, short-term savings/consumption behavior, and a dual financial market (Rosegrant and Herdt 1981).

Prior to 1973/74, few Philippine rice farmers had access to institutional credit, primarily because of high collateral requirements of private banks (Sacay 1973). A series of typhoons in 1972 reduced the rice crop 16 percent from the previous three-year average, and during the same year the entire country was brought under a land reform program that was expected to restrict severely the credit traditionally provided by landlords to share tenants. Attempting to boost rice production, the government increased the flow of low-cost credit to rice farmers in 1973/74 through a program called Masagana 99.

During Masagana 99's initial year, farmers were allowed to borrow up to 900 pesos per hectare (P/ha) per six-month season. In 1974/75 the loan limit was increased to P 1,200/ha (P 7.30 = US$1 between 1973 and 1979). These production loans were available at an effective interest rate, including service charges and discounting, of approximately 16 percent per year in money terms. In 1974/75, over 40 percent of the national rice area was financed under Masagana 99. Financing declined to about 10 percent in 1977/78, mainly because frequent defaults disqualified farmers from further borrowing under the program.

Table 13.1 shows the declines in total loans granted and number of borrowers. The repayment rate also has generally declined, largely because late repayments increased the totals of the early years. Collections as of the due date are much lower. Due date collections of rural banks for Phases IV–XI were 67.5 percent, compared to 80 percent as of April 1979 (Esguerra n.d.).

The primary alternative source of production loans is the informal financial market. Credit availability in this sector varies, but surveys conducted by the International Rice Research Institute indicate a range of effective credit ceilings of P 300–P 600/ha in central Luzon. Informal market interest rates vary from 30 percent to 100 percent and average 45 percent to 50 percent (Rosegrant 1978; Manto and Torres 1974).

The Philippine government also established a two-tier fertilizer pricing system in 1973, when supplies in the international market were becoming tight and world prices were increasing rapidly. A subsidized price was established for rice and other food crops. A higher price for export crops

Table 13.1 Masagana 99 total country program, phases I–XI, Philippines, 1973–79

Phase	Year/season	Total loans granted	Area financed	Farmers served	Average loan granted		Repayments	
		(million pesos)	(hectares)		(P/ha)	(P/borrower)	(million pesos)	(%)
I	1973/wet	369.5	620,928	401,461	595	920	347.4	94
II	1974/dry	230.7	355,397	236,116	649	977	216.9	94
III	1974/wet	716.2	866,552	429,161	826	1,353	601.6	84
IV	1975/dry	572.3	593,624	354,901	964	1,612	469.1	82
V	1975/wet	573.0	558,335	301,828	1,026	1,898	435.4	76
VI	1976/dry	255.6	255,884	150,464	999	1,699	207.3	81
VII	1976/wet	275.1	244,467	144,265	1,125	1,907	219.4	80
VIII	1977/dry	164.4	148,801	89,623	1,105	1,834	133.1	81
IX	1977/wet	251.8	221,522	131,590	1,136	1,914	185.2	74
X	1978/dry	175.1	155,095	92,476	1,130	1,903	140.1	80
XI	1979/wet	236.9	202,606	116,624	1,167	2,025	161.0	68
Total		3,820.6	4,223,211	2,448,509	905	1,499	3,116.5	82

Sources: Computed from basic data from the National Food and Agriculture Council, Ministry of Agriculture, Diliman, Quezon City, Philippines; Esguerra n.d.

reflected import and marketing costs. This system continued until 1975/76, after which a uniform, subsidized price applied to all crops (table 13.1).

THE MODEL OF FARMER DECISIONMAKING

Figure 13.2 outlines the model. Initially, output and input prices and initial savings are set and farm characteristics specified to determine a yield distribution for any set of inputs. The yield distributions were computed from a production function incorporating random environmental variables and their estimated frequency distributions (Rosegrant and Herdt 1981). The financial market in which the farmer borrows determines his interest rate and credit ceiling. The net income distribution for any input level can then be computed and optimal input levels chosen by the specified decision rule, subject to the credit ceiling.

The actual yield is generated by random sampling from the yield distribution corresponding to the optimal input level, and actual net income is computed. If net income plus nonfarm income exceeds subsistence requirements, savings are carried forward to the next season to begin another iteration. If total income is less than subsistence, the farm defaults on its loan and, if necessary, borrows from the informal credit market to cover subsistence requirements. Savings are computed, and the next iteration begins with the farm denied access to the institutional market because of default. If total income exceeds subsistence requirements, the farm remains in the institutional market and begins the next iteration.

For any set of specified prices, interest rates, loan ceilings, and farm characteristics, the model can be solved for mean input use, yield, and income over several seasons.

Impact of Credit and Fertilizer Policy

A subsidized credit program with increased loan ceilings, similar to those under Masagana 99, and a fertilizer subsidy comparable to that of the Philippine government were evaluated for crop years 1973/74 (the first year of Masagana 99) through 1977/78. Model parameters such as farm size, nonfarm income, wages, rents, herbicide and insecticide prices, and sharing rates were set at representative values for central Luzon. Farm prices of rice were set at the prevailing annual level.

Fertilizer prices were set for successive runs of the model at the annual subsidized and unsubsidized rates derived from table 13.2. Financial market variables were set to simulate the presence or absence of a Masagana-type credit program. For model runs simulating a credit program, all farms were assumed to begin in the institutional market, with a loan ceiling of P 1,200/ha and an interest rate of 16 percent per year. The farms

Figure 13.2 Flow chart of farm decisionmaking model

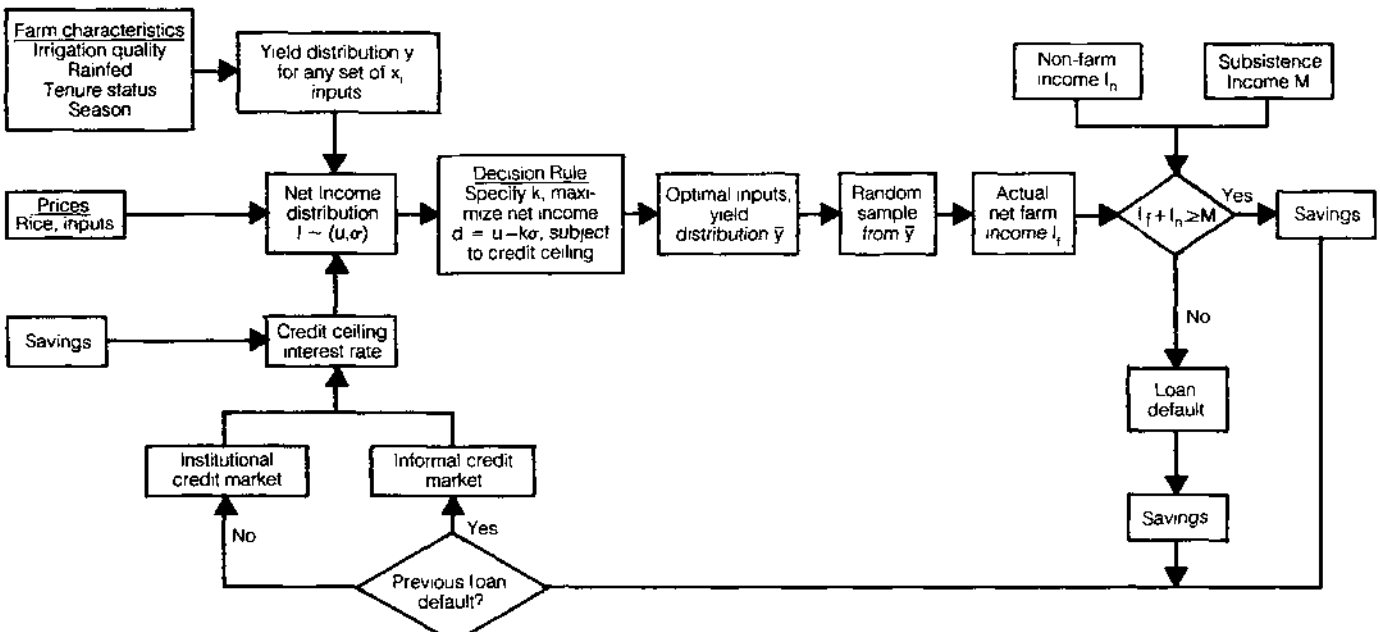


Table 13.2 Prices of nitrogen and phosphorus fertilizer (p/kg) for rice and export crops and subsidies, Philippines

Crop year	Price for rice production		Price for export crops		Rice production subsidy[a]	
	Nitrogen	Phosphorus	Nitrogen	Phosphorus	Nitrogen	Phosphorus
1973/74	2.15	2.56	3.82	4.22	1.67	1.66
1974/75	4.38	3.83	7.07	6.48	2.69	2.65
1975/76	3.97	3.84	6.24	6.34	2.27	2.50
1976/77	3.68	4.09	3.68	4.09	0.72	1.21
1977/78	3.68	4.09	3.68	4.09	0.22	0.51

Source: Rosegrant and Herdt 1981, data from Fertilizer and Pesticide Authority, Republic of the Philippines.

[a] This figure represents the difference between the price for rice production and for export crops for 1973/74 to 1975/76; it represents import plus marketing costs less sale price for 1976/77 and 1977/78.

continue to borrow in the institutional market until default, after which they enter the informal market.

Interest rates in the informal market were set at 48 percent per year, with maximum loan limits at P 300/ha and P 600/ha for alternative runs. For model runs simulating the absence of a subsidized credit program, all farms were assumed to borrow only from the informal market.

Three policies were evaluated: the credit program with the fertilizer subsidy, the credit program with no fertilizer subsidy, and the fertilizer subsidy with no credit program. In each case, the estimated impact of the policies is compared with the case of no government credit program and no fertilizer price subsidy.

Combined Credit Program with Fertilizer Subsidy

The combined impact of the credit program and fertilizer subsidy is large with either informal credit market loan limit (table 13.3). With a P 300/ha loan limit in the informal market, the combined credit program and fertilizer subsidy is estimated to increase the average nitrogen use on irrigated and rainfed farms by 43 kg/ha, other input use by P 129/ha, yields by 510 kg/ha (30 percent), and income by P 131/ha (29 percent). For the P 600/ha informal market loan ceiling, the estimated combined impact is reduced but still impressive: average increases of 38 kg/ha in nitrogen use, P 90/ha in other inputs, 393 kg/ha (21 percent) in yields, and P 118/ha (25 percent) in income.

Irrigated farms are considerably more responsive to combined credit and fertilizer policies than rainfed farms. They also gain higher benefits.

Table 13.3 Estimated increases in input use, yield, and income due to credit program and fertilizer subsidy, 1973/74 and 1977/78

Policy	Farm type	Nitrogen	Other inputs	Yield	Income
		(kg/ha)	(P/ha)	(kg/ha)	(P/ha)
		Informal market loan limit of P 300/ha[a]			
Credit program, fertilizer subsidy	Irrigated	49	162	619	158
	Rainfed	30	69	308	81
	Average[b]	43	129	510	131
Credit program, no fertilizer subsidy	Irrigated	22	127	397	67
	Rainfed	7	41	114	34
	Average[b]	17	103	298	56
Fertilizer subsidy, no credit program	Irrigated	14	−13	106	55
	Rainfed	14	−5	102	38
	Average[b]	14	−10	105	49
		Informal market loan limit of P 600/ha[a]			
Credit program, fertilizer subsidy	Irrigated	42	115	466	142
	Rainfed	30	45	257	74
	Average[b]	38	90	393	118
Credit program, no fertilizer subsidy	Irrigated	13	78	221	49
	Rainfed	6	12	50	28
	Average[b]	10	54	127	35
Fertilizer subsidy, no credit program	Irrigated	30	47	311	85
	Rainfed	6	33	207	39
	Average[b]	27	35	274	69

Source: Rosegrant and Herdt 1981.

[a]Estimated increases are computed relative to the case of no credit program and no fertilizer subsidy.

[b]The average taken of irrigated and rainfed farms, weighted by the area harvested in central Luzon.

The reasons for their higher responsiveness are to be seen in the separate effects of the credit program and fertilizer subsidy.

Credit Policy

The credit program alone produces substantial gains for irrigated farms but considerably lower benefits for rainfed farms. For the P 300/ha case, for example, irrigated farms increase yields by 22 percent and income by 14 percent due to implementation of a credit program without fertilizer subsidy, while the yield and income benefits for rainfed farms are 7 percent and 9 percent, respectively.

Irrigated farms gain higher benefits from a credit program that releases a binding credit constraint because they can utilize higher input levels more profitably. This is due to lower moisture stress in both seasons, high solar radiation, and lack of typhoons in the dry season, which increase the

marginal productivity and optimal level of nitrogen and other inputs, leading to larger benefits than on rainfed farms.

Additional runs were made to estimate the impact of reducing interest rates from 48 percent to 16 percent without increasing the availability of credit. The independent impact of such a reduction in interest rate is relatively modest: an average increase, for irrigated and rainfed farms, of 5 kg/ha in nitrogen, 3 percent in yields, and 6 percent in income with the P 600/ha loan limit, and 3 kg/ha nitrogen, 2 percent in yield, and 3 percent in income with the P 300/ha loan limit.

The maximum interest rate impact occurs when credit is not constraining, so farmers can respond fully to price. Sensitivity tests using the model with no credit constraint show a maximum increase in yields of 5 percent and in incomes of 10 percent caused by a reduction in the interest rate from 48 percent to 16 percent. When the credit ceiling is binding, price changes are not effective. Instead, an interest rate reduction works by increasing the amounts of inputs which can be financed for a given amount of credit by increasing income and savings available to finance inputs. This effect is smaller than the price impact, and causes a reduced interest rate effect when a binding loan constraint holds for some or all farms.

Default Rates

The model predicts average annual default rates on institutional market loans of 9.7 percent with the fertilizer subsidy and 10.6 percent without subsidy. This is lower than the total repayment rate (table 13.1) because the model simulates only nondiscretionary default, and does not include discretionary default. As of the 1977/78 crop year in the simulated credit program, only 66 percent of farmers were eligible for institutional credit in the subsidized fertilizer case and 63 percent in the unsubsidized fertilizer case. With a P 300/ha informal market loan limit, the average yield loss due to default in 1977/78 was 8 percent with income reduction 6 percent. For the P 600/ha informal loan limit case, the reductions in benefits due to default were approximately half as large.

Fertilizer Subsidy

The impact of a fertilizer subsidy with no credit program is highly dependent on the availability of credit in the informal market. With the P 300/ha loan limit (which is binding on most farms), the decrease in the price of fertilizer (due to the subsidy) permits 14 kg/ha more fertilizer to be financed within the loan limit. Other input use decreases by P 10/ha because a small amount of the other inputs are replaced by fertilizer, which, because of the subsidy, becomes relatively more profitable. The net yield

benefit of the fertilizer subsidy is 6 percent, with incomes increasing 11 percent. Irrigated and rainfed farms get approximately the same benefits.

With the P 600/ha informal credit limit (which is nonbinding on many farms), the fertilizer subsidy boosts fertilizer use through the price impact, increasing marginal returns and optimal fertilizer levels. It also permits more fertilizer to be financed through loans. The impact of the subsidy on fertilizer use is nearly double that of the P 300/ha loan limit case. With the higher loan limit, irrigated farms get 50 percent higher yield benefits and double the income benefits of rainfed farms due to the higher productivity of fertilizer.

GOVERNMENT FINANCIAL COSTS AND SUBSIDIES FOR MASAGANA 99

The production and income benefits of the Masagana 99 credit program should be compared with the cost to the government and the total subsidy to financial institutions and farmers. Two sources of costs can be identified: interest rate subsidies due to provision of capital to banks and farmers at less than the cost to the government and losses on defaulted loans guaranteed by the government. In order to estimate these costs we must understand the method of financing the program. (The descriptive material which follows is drawn largely from Esguerra [1981 and undated]. Esguerra used a similar framework for analysis of program subsidies, but an incorrect definition of the opportunity cost of capital inflated his subsidy estimates.)

Masagana 99 subsidized credit was channeled to farmers through rural banks, the Philippine National Bank (PNB) and other commercial banks, and the Agricultural Credit Administration (ACA, a cooperative organization). The first two sources accounted for nearly 48 percent, respectively, of the total loans to farmers in 1973–79; ACA accounted for less than 5 percent. Over 99 percent of the total provided by commercial banks was supplied by PNB. In the following discussion, PNB refers to the other commercial banks as well.

At the beginning of each phase, seed money for Masagana 99 farmer loans was provided by the central bank to the rural banks and PNB through Special Time Deposits (STDs) with interest rates of 3 percent per annum, payable in sixty days. However, the full portfolio of loans to Masagana farmers was eventually funded by rediscounting of farmer-borrowers' loan papers to the central bank. First, farmer-borrowers' loan papers whose financing needs were initially covered by funds from STD releases were rediscounted to the central bank, providing funds for additional lending. The loan papers from the succeeding set of lending transactions were in

turn rediscounted to repay the STDs from the central bank. The rediscounting process continued until the lending institutions were able to cover all loan requirements and pay back the STDs. ACA did not have access to STD and rediscounting arrangements. It utilized internal funds which came from the national government budget for Masagana lending operations.

The total financial cost to the government of the interest rate subsidy under the program can be computed as $R(r_c - r_p)m$, where R is the total amount of loans rediscounted to the central bank, r_c is the cost to the government of obtaining the funds for rediscounting, r_p is the preferential rediscount rate to the rural banks and PNB, and m is the maturity of the loan expressed as a fraction of a year (0.50 for six-month loans).

Masagana 99 loans rediscounted to the central bank during 1973–79 totaled more than P 3.5 billion (table 13.4). The preferential rediscount rate was 1 percent to rural banks, 3 percent to PNB during phases I–VII, and 1 percent to PNB thereafter. The funds provided by the central bank to finance the rediscounting came from the proceeds of Central Bank Certifi-

Table 13.4 Total financial cost to the government and total subsidies to financial institutions and farmers, Masagana 99, phases I–XI, Philippines, 1973–79

	Rural banks	PNB	ACA[a]	Total
		(million pesos)		
(1) Total loans rediscounted to central bank	2,405.2	1,121.8	—	3,527.0
(2) Financial cost to government of interest rate subsidy	134.1	54.2	—	188.3
(3) Total interest rate subsidy	204.4	95.4	—	299.8
(4) Total loans granted to farmers	1,817.5	1,821.9	181.2	3,820.6
(5) Interest rate subsidy to farmers	18.2	18.2	—	36.4
(6) Interest rate subsidy to financial institutions: (3) − (5)	186.2	77.2	—	263.4
(7) Total loans in default	258.5	386.7	59.1	704.3
(8) Financial cost to government of default	193.9	290.0	44.3	528.2
(9) Total financial cost to government: (2) + (8)	328.0	344.2	44.3	716.5

Source: See table 13.1.

[a]Subsidy not computed on ACA loans because internal funds were utilized. At market interest rates, the total interest rate subsidy would be P 14.5 million.

cates of Indebtedness (CBCIs), on which the government paid a 9 percent rate of interest. However, CBCIs are not subject to the usual 35 percent tax on interest income, so the gross cost (r_c) to the government of the loanable funds for Masagana 99 was 12.15 percent per annum. The net cost of the interest rate subsidy was therefore 11.15 percent per annum (9.15 percent for PNB, phases I-VII) for every peso channeled through the rural banks and PNB to farmer-borrowers. The total financial cost of this subsidy was about P 188.3 million through 1979, or about P 45/ha averaged over the area financed by the program (table 13.4).

This amount, however, understates the total subsidy channeled through rural banks and PNB. To compute the total subsidy, the interest rate used should be the opportunity cost of capital. Estimates of the true opportunity cost of capital during this period range from 14 percent to 20 percent (Bautista et al. 1979). A rate of 18 percent per annum is used here.

The distribution of this subsidy between financial institutions and farmer-borrowers is an important issue, since boosting farm income was a major goal of the program. The interest rate subsidy to farmers can be computed as $L(r_o - r_f)m$, where L is the loan amount received by farmers, r_o is the opportunity cost of capital, and r_f is the effective interest rate to farmers on Masagana 99 loans (16 percent). As shown in table 13.4, the total interest rate subsidy to farmer-borrowers in 1973–79 was P 36.2 million, leaving a total interest rate subsidy to the rural banks and PNB of P 263.4 million. In other words, 88 percent of the total interest rate subsidy provided under the Masagana 99 program was retained by the financial institutions, with farmer-borrowers receiving only 12 percent. Additional service charges were imposed on some farmers which could increase the effective interest rate on Masagana loans to 30 percent. Farmers charged these rates were actually taxed relative to the opportunity cost of capital.

The rural banks retained a particularly high proportion (91 percent) of the interest rate subsidy channeled through them. This high retention rate is due to the fact that almost P 600 million of rediscounted funds did not reach farmers under the Masagana 99 program (table 13.4). Almost one-fourth of the funds acquired by rural banks at the Masagana 99 preferential rediscounting rate were apparently diverted to other investments.

In addition to the financial costs to the government of providing the interest rate subsidy, losses were incurred due to the default of Masagana 99 farmer-borrowers. The government guaranteed 75 percent of each loan, thereby absorbing three-fourths of the losses due to default. As shown in table 13.4, these losses totaled P 528.2 million during phases I-XI, bringing total government financial costs to P 716.5 million, or an average over the total area financed of P 170/ha. The total financial costs to the government are thus higher than the farmer income benefits estimated for the program.

CONCLUSIONS AND IMPLICATIONS

Following the very poor harvest of 1972/73, the Philippine government instituted subsidized credit and fertilizer policies. Between 1972/73 and 1977/78, Philippine rice production increased by 56 percent and rice yields increased by 38 percent. This outstanding achievement could not be attributed only to government credit and fertilizer policies. The analysis, using a dynamic model of farmer decisionmaking, shows that credit and fertilizer policies could have induced a yield increase of 21 to 30 percent for a set of farms representative of those in central Luzon.

The analysis of program benefits confirms that the provision of institutional credit to farmers when the supply of credit from informal sources is limited and inelastic and productive technology is available can generate large gains in input use, yield, and farmer income. The importance of the availability of appropriate production technology is underscored by the failure of the Philippine government credit programs for corn production due to the lack of profitable technology adapted to farm conditions.

Provision of credit also increases the impact of subsidies on other inputs such as fertilizer. Where the availability of loan funds from informal sources is limited, the credit program makes its greatest impact on the effectiveness of fertilizer price subsidies by releasing the credit constraint through institutional lending. The independent effect of interest rate reductions is relatively small. Even when productive technology is available, the demand for credit and inputs purchased with this credit is relatively inelastic with respect to the interest. Significantly higher interest rates than those prevailing in the Masagana 99 program could be charged without substantially reducing yield increases and farmer income benefits.

The estimated financial costs of the program to the government were even higher than the large estimated farmer income benefits. Furthermore, nearly all of the interest rate subsidy financed by the government was captured by the financial institutions rather than by the farmers. Few of the resources captured by financial institutions were reinvested in institution-strengthening activities. Although new institutional lenders will tend to have poor information links, high default risks, and high transaction costs in lending when entering the agricultural market, the level of subsidy provided to compensate the institutions (a 15 percent spread between the cost of funds to the banks and their lending rate) appears excessive by any standards. With an 18 percent default rate on Masagana 99 loans and only 25 percent exposure of the banks on defaults, the total loss through defaulted loans would be only 4.5 percent, leaving a very large interest spread to cover all other costs of administering the loans.

The large interest rate subsidies and high level of government guarantee of loans reduced incentives for the banks to pursue collections aggres-

sively. The farm decisionmaking model predicts average annual default rates of around 10 percent, based only on nondiscretionary default. The actual 18 percent rate of default thus includes a large amount of discretionary default which could have been reduced by active collection. The increasing rates of default over time show that the collection performance of banks declined, significant evidence of lack of institutional development.

The low cost of funds (1 percent) for the Masagana 99 program discouraged banks from seeking alternative sources of funding. With an interest rate on customer deposits of 6 percent, there was little incentive to seek such deposits. A study by the Technical Board for Agricultural Credit showed that short-term obligations to the central bank constituted an average of over 50 percent of the assets of rural banks in 1979.

In general, the financial institutions substituted the high level of subsidies for the development of management capabilities. The banks were unable to compete effectively in the agricultural credit market without such subsidies. The failure to develop the banks as viable competitive institutions by linking subsidies to institutional development locked the government into continuing high-cost subsidies.

A number of lessons can be drawn from the Masagana 99 program. Subsidies to farmers on agricultural credit relative to informal market interest rates are justified when there is a monopoly profit element in these interest rates arising from differential access to information and differential transaction costs. If profitable technology is available and the supply of credit from informal sources is limited, institutional credit can provide large production and income benefits. Even if new technologies such as modern rice varieties can be adopted on a step-by-step basis, adequate credit can be essential to achieving full benefits from its adoption.

Subsidizing interest rates at levels below the opportunity cost of capital, or below market-determined rates in the urban sector, do not appear justified. For example, raising interest rates on Masagana 99 loans to the opportunity cost of capital (or even higher) would have had little effect on loan demand and program benefits. Moreover, an increase in interest rate would permit a reduction in the subsidy required to induce financial institutions to enter the agricultural credit market.

Subsidies to financial institutions on the costs of funds for agricultural loans in the early stages of their penetration of the agricultural market appear to be justified. However, the government should emphasize developments which will increase their access to information and reduce transaction costs. This would permit a phased reduction in subsidies to the banks.

This is the fundamental dilemma facing governments in devising a policy to develop a viable agricultural credit delivery system. In the early

stages of development of new production technology, it is important to channel loanable funds to farmers. During this period, subsidies will be required to induce institutions to lend. In the medium to long term, however, the main constraint to development of a viable agricultural credit sector is not the cost or availability of loanable funds but the development of human capital within financial institutions. How the government manages the transition from short-term subsidies to long-term financial stability through institutional development will determine the success of government credit policy.

Criticism of the traditional rationale for government credit programs has been useful in pointing out the importance of institution-building in rural financial markets and the allocative problems caused by subsidized interest rates in the agricultural sector. However, it has been too quick to dismiss the possible role for subsidies during the early stages of institutional development of agencies entering agricultural credit markets. More important, the critique has failed to recognize the potential benefits from supply-oriented credit programs when the supply of credit from informal moneylenders is inelastic and insufficiently responsive to the development and introduction of new technologies.