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FINANCING THE BEGINNING FARMER:
TOWARDS MORE REALISTIC FARM
PURCHASE LOAN REPAYMENT
ARRANGEMENTS

By

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FINANCING THE BEGINNING FARMER: TOWARDS MORE REALISTIC
FARM PURCHASE LOAN REPAYMENT ARRANGEMENTS**

(Paper to be presented at the Second International Conference on
Rural Finance Research Issues, Calgary, August 1979)

by Don McClatchy*

ABSTRACT

Increasing capital requirements per farm have been, for some time, generating increasing problems of entry for beginning farmers. This paper develops the theme that the main problem lies with the timing of the interest and principal repayment costs associated with conventional farm real estate mortgages.

Returns to the farm investment are seen as accruing in two main forms, -- capital gains and annual net rental income (cash or residual basis). A review of empirical evidence covering the last two decades suggests that the average North American farm purchaser could reasonably perceive the present value of his expected future returns as being split fairly equally between these two forms. The timing of capital gains receipts is totally inappropriate for the servicing of a traditional mortgage loan. Mr. Average Farmer is, therefore, only justified in borrowing more than about one half of the purchase price to the extent that he is willing to contribute some of his 'normal' labor and management return and other income towards servicing a larger loan.

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**it is emphasized that the views expressed in this paper are not necessarily those of the Government of Canada, nor are they necessarily shared by other employees of Agriculture Canada. Helpful comments from Bruce Ross, David Harrington, Bob Cumming, Wayne Jones, Lars Brink, Terry Kremen'uk, Warren Lee, Fu-lai Tung, Ron Rust and Brian Perkins at various stages in the preparation of this paper are gratefully acknowledged. The author accepts, of course, full responsibility for the deficiencies which remain, and wishes to implicate none of the above-named in either the arguments developed or the conclusions reached.

It is concluded that the most promising solution to the policy problem of facilitating (without recourse to subsidies) the entry into full-time farming of a young person with skills but limited equity capital lies in incorporating more flexibility into the terms and conditions of the farm mortgage loans which are available. Several alternatives are discussed. More research into the potential impacts of such alternatives, and into their institutional drawbacks and means of overcoming the same, is called for.

I DEFINING AND REFINING THE PROBLEM:

Some new farmers who so wish are able to phase into full-time farming gradually by beginning as part-time farmers, then, stepwise over time, accumulating more farm assets and increasing their time-involvement in farming. Others are able to begin by renting a large proportion of the farm resources they use. In both these cases the need to acquire, in the initial stages, the full complement of capital assets required for a viable modern full-time enterprise is postponed. Yet other starting farmers have accumulated considerable equity capital or have access to private (e.g. family) financial backing at preferred rates.

However, there remain many beginning farmers who, either by necessity or preference, seek to borrow, publicly or commercially, a substantial portion of the money capital they require to enable them to buy a farm. Financial problems of entry for such farmers have frequently been recognized and discussed, and, on occasion, there have been calls for special credit deals for them.¹ Some authors have suggested that financial difficulties for starting farmers are increasing over time², and the relative extent of concern in very recent years tends to indicate the same.

What, precisely are the reasons for this financial problem for the beginning farmer, and why is it perceived to be worsening over time? My thesis is that the cause of the problem lies in the coexistence of two phenomena, one structural and one institutional:

- a) Capital values per farm, in constant dollar (real) terms, have been increasing, and will continue to increase, over time.
- b) Farm real estate mortgage loans are generally required to be serviced by way of constant (in nominal or current dollar terms) annual or more frequent payments which will result in the loan being fully-retired within 20-30 years or less.

Changes in the constant (1976) dollar average market values of total farm capital and of farm real estate per Canadian census farm are shown in Table 1. Between 1961 and 1976 the average real value of total farm capital and of farmland and buildings rose by 210 percent and 262 percent respectively. The upward trend in these measures, evident also in the U.S. data and those of other countries, is already well recognized.

The implication of this trend is that today's starting farmer must put together relatively more finance (in real terms), in order to purchase a viable-sized farm, than did his counterpart of previous decades. The next generation's beginning farmer will have to find even more. Either he must save more personal equity capital, or borrow more, or both.

There is a danger in perceiving this need for relatively more and more capital finance over time as the whole problem. Such a limited perception tends to lead to the conclusion that if more finance is made available to starting farmers the problem will be solved. In other words, the problem has been seen by many as deriving from the quantity of farm real estate mortgage credit made available to young farm buyers.

It may have been this type of reasoning which led to the Federal Land Banks in the U.S. raising their maximum loan commitment from 65 percent to 85 percent of appraised value in 1971. In Canada, the Farm

Credit Corporation's (F.C.C.) lending limits, in both absolute and percent of farm value terms, have been raised substantially in recent years³. Furthermore, the F.C.C. has been emphasizing loans to younger farmers: in both 1977/78 and 1978/79, farmers under 35 years old accounted for 72 percent of the number of all F.C.C. loans made under the Farm Credit Act.

Yet, at least in Canada, farm buyers have not in general been taking advantage of these liberal limits offered by the major institutional farm mortgage lender. In 1977-78, for example, the average F.C.C. borrower under 35 had a net worth of around \$115,000 and a debt to total asset ratio of 52 percent⁴. Only 11 percent of such borrowers in 1977/78 and 14 percent in 1978/79 had debt to total asset ratios of more than 80 percent⁵.

It would appear, therefore, that the majority of farm buyers have not been willing or able to borrow the great bulk of the finance required for farm purchase, even though such credit was evidently available to them. Rather, this majority have coped somehow with the problems of building a relatively high personal net worth before attempting to buy their own farm. The main reason why the majority of farm buyers are not taking advantage of the larger amounts and proportions of farm real estate credit now offering is, in my view, because nothing has been done yet about the other, institutional, part of the problem.

The other part of the problem has already been recognized or alluded to by several other authors⁶. The first main aim in this paper is to analyze and describe it somewhat more thoroughly than, to my knowledge at least, has heretofore been done. The second main aim is to make some suggestions about what might be done to overcome the problem.

Gilson (1973) clearly recognized the other part of the problem when he wrote (p. 9)

"The growing capital investment of the farm business may make it an unreasonable goal for the farmer to have a debt-free farm by the time of retirement. Conventional credit policies have encouraged or have made it necessary for farmers to have a debt-free farm by the time they retire. Perhaps we should have an agricultural credit policy which would permit farmers to pay off only one half or two thirds of the mortgage during their lifetime. Provision for partial repayment of the debt capital during one generation would provide farmers with some relief from the "forced savings" situation in which they now find themselves." (my underlining).

Put another way, because of the terms and conditions for servicing conventional farm purchase loans, farmers have only been able to borrow up to the amount which they would be able to save and pay back within a farming lifetime. Furthermore, as is shown below (Table 3 and Figure 3) the situation becomes progressively more severe as the rate of inflation rises. A higher rate of inflation means that the repayments, in real terms, are brought further forward in time, since, in nominal terms, they remain constant over time. Farm net incomes, on the other hand, tend to grow over time with inflation.

In my view this "second part of the problem" is best thought of as a timing problem: more specifically, an inconsistency between the timing of the economic returns to the farm purchase (real estate) investment and the timing of the costs of the long-term mortgage credit available to finance this investment. Economic returns to the farm real estate investment come in two main forms, - productive rental (cash or residual) returns each year and capital gains. A review of some empirical evidence for the last two decades suggests that, for the average North American farmer, the total returns in real terms have been split fairly equally between these two sources (see next section and Appendix). However, the timing of the capital

gains return makes it totally unsuitable to be used in servicing a conventional farm real estate mortgage loan. Thus, one might conclude that a North American farmer who in the last 20 years used a farm mortgage loan to finance about one half of the value of a farm purchase (and many did) would have exhausted most or all of the annual rental return to the whole farm in servicing the loan. In addition, he would have had to accept virtually all returns to his own invested equity capital (equal to about one half of the purchase price) in the form of capital appreciation in the market value of the farm real estate, which is not realized until the farm is sold.

II ILLUSTRATION OF THE 'TIMING' PROBLEM: LOAN PAYMENTS vs FARM INVESTMENT RETURNS RECEIPTS

This timing problem is probably best illustrated by way of an example. While it is not claimed that the following example fits the situation of all, or even most, farm purchase situations in Canada or the U.S. it is intended to represent the most typical farm purchase investment situation using a realistic purchase price for a viable full-time farm under today's market conditions, - \$200,000.

Expected Returns

There seems to have been a marked reluctance on the part of some agricultural economists and others to accept the simple business fact that returns to the investment in farm real estate accrue in two major, albeit quite dissimilar, forms, - an annual productive rental and a terminal lump-sum capital gain⁷. No doubt such reluctance stems, in large part, from differences in the timing and in the relative risk associated with these two elements of the total investment return. However, today's typical farm buyer is to some extent a land speculator, whether he wants to be or not, in that much of the return to his investment will accrue in the form of appreciation in the market value of the asset, and he must accept the

risks involved in the variability and unpredictability of that appreciation⁸. In all likelihood, the expected stream of annual rental returns will not be sufficient, on their own, to provide a normal rate of economic return to the investment, given the market price for the farm.

a) Annual Rental Returns

There are two useful approaches to obtaining empirical estimates of the average annual rental return to farm estate. One is to observe, perhaps by way of a survey, market cash rental rates. The other is to calculate the return to farm real estate as a residual income return after cash costs (excluding interest charges), depreciation, a fair labor/management return to the operator, and a return to non-real-estate farm capital have all been deducted from gross farm receipts (the latter adjusted for inventory changes). In general, despite differences in methodology and geographical scope, the results of different studies, both within and between the two approaches, have been reasonably consistent.

Cash rents are generally in the range of 2 to 6 percent of current market value of farm real estate, and average out over time and space at about 4 percent⁹. Similarly, comprehensive analyses of the residual returns to farm real estate, in both the U.S. and Canada, have indicated average annual rates in the range of 3 to 4 percent of market value¹⁰. For the purposes of example, it will be assumed that a typical North American farm buyer could reasonably expect an annual rental return of 3.5 percent of the current market value of the farm real estate.

b) Capital Gains Return

Empirical evidence on annual rates of appreciation in market values of farm real estate in general shows relatively more time and space variation than do the results of the annual rental return studies. However, once adjustments are made for the effect of the level of general price inflation, results here too become reasonably consistent. Our typical farm buyer would appear to be justified to expect that market value of his land and buildings, assuming normal maintenance and after netting out the value of any further improvements he intends to make, to appreciate at an annual rate 3.5 percent higher than the rate of general price inflation, on average¹¹.

To complete the picture, it will be assumed that the expected annual rate of (general price) inflation is 8 percent and that our 'typical' farm buyer intends to farm the land for 30 years prior to selling it and retiring.

Together, all the above assumptions suffice to allow the time stream of expected annual rental returns and the expected selling price after 30 years to be calculated (see Table 2 and Figure 1). The method of these calculations, and the generalized farm purchase decision model of which they are components, are defined in the Appendix.

Mortgage Loan Payments

The above 'typical' time-stream of returns to a \$200,000 farm real estate investment can now be compared to the time-stream of payments which would be required to service a conventional mortgage loan. Initially, it will be assumed that a loan to cover 90 percent of the purchase price (\$180,000) is being considered, that the term would be

30 years, and that an interest rate of 10 percent would correspond realistically to the expected inflation rate of 8 percent. Such a loan would require constant annual payments (nominal terms) of \$19,098, since a \$1 loan under such conditions would require annual payments of \$0.1061.

In Figure 2, such mortgage loan payments are superimposed on the expected time stream of investment returns from Figure 1. It can be readily seen that, up until year 9, loan payments would exceed the expected returns. Thus, in these years, such payments will be possible only if other portions of total farm income, such as labor/management returns, or depreciation allowances, are able to be allocated to servicing the loan rather than to meeting family living expenses or replacing machinery. On the other hand, after year 9 expected returns exceed loan payments by a rapidly growing annual amount.

The Maximum Affordable Loan

Under the strict conditions -

- a) that each annual mortgage loan payment must be made when it comes due¹², and
- b) that only the annual rental income (cash or residual basis) accruing to farm real estate capital is available to service the mortgage loan;

then it follows that the maximum affordable loan, under a conventional 'level-payment' arrangement, is determined by the lowest expected annual rental return in nominal dollar terms. Under our assumptions this will occur in the first year, when the expected annual rental

return is \$7,805 (Table 2). Thus, where L denotes the size of the loan, the condition

$$0.1061 L \leq 7805$$

must be satisfied, which in turn implies that

$$L \leq 73,563$$

In words, if the above strict conditions hold, then our intending farm buyer could not afford to borrow more than 37 percent of the \$200,000 required to purchase the farm. He would be obliged to contribute more than \$126,000 of his own equity capital. This 'maximum affordable loan' situation is depicted in Figure 4. The area between the 'maximum conventional mortgage' payments line and the graph of expected farm real estate returns is indicative of the excess funds which would be available over time to service a larger loan if the timing of the combined interest and principal payments could be designed to better fit the time pattern of investment returns.

In practice, any given farm buyer may be able to afford to borrow more than 37 percent of the purchase price for one or more of several possible reasons; -

- i) Because he possesses a better-than-average farming ability, resulting in the expected annual residual returns to farm real estate capital being higher than 3.5 percent of their market value; or
- ii) Because of a willingness to accept lower-than-normal returns to labor/management (for personal living expenses) thus augmenting the residual available to service long-term debt (i.e. willingness to accept a "forced savings" situation); or

- iii) Because of an ability to delay maintenance and net replacement costs until after the first few years when cash flow problems are at their most severe; or
- iv) Because the farm is atypical by national average standards in terms of the proportions (or rates) of returns which are expected to accrue as capital gains, and as annual rental returns, respectively.

In practice, such considerations may justify some relaxation of some of the more stringent explicit and implicit assumptions made above, when calculating a 'maximum affordable loan'. Nevertheless, the numerical results of the preceding arithmetical exercise, plus observed farm industry structural trends, point to the following conclusions:

1. The equal payments plan of a conventional real estate mortgage loan makes it very unsuitable for financing the farm real estate investment, considering the timing of the expected returns to this investment (Figure 2).
2. Financing the purchase of a farm with a conventional farm mortgage loan to cover around 90 percent of the purchase price would be out of the question for most young starting farmers, because of the 'timing' problem.
3. As real capital values per farm increase over time (Table 1) the problem becomes more serious, because there is less and less chance of achieving the rate of savings necessary to clear all debt prior to retirement.

Retaining earlier assumptions, - that farm real estate appreciates in value at an annual rate 3.5 percent greater than the rate of inflation, that annual rental returns to farm real estate average 3.5 percent of current market value, and that farm mortgage interest rates are 2.0 percent higher than the rate of inflation, - differences between annual rental returns and annual payments on a conventional farm mortgage loan for 50 percent of the farm purchase value are explored under a range of inflation rates in Table 3 and Figure 3. This simple exercise suffices to show clearly that the higher the inflation rate the lower will be the maximum affordable loan and the more serious will be the discrepancy between the time streams of rental returns and of loan payments. Such considerations lead to a fourth conclusion:

4. The higher is the rate of general price inflation the more serious is the 'timing' problem.

It is hypothesized that the further refinement of the preceding rather simplistic analysis, to incorporate, for example, taxation considerations and other elements (non-real-estate assets, working capital) of the total farm finance picture, would not substantially alter the broad magnitude of the conclusions already reached. Clearly, the verification of this hypothesis would strengthen the arguments of this paper. Time and space limitations do not allow this to be attempted here.

III A PROPOSED CONCEPTUAL SEPARATION OF SOME FARM CREDIT PROBLEMS

This brief section constitutes somewhat of a diversion. It is intended to help the reader and, perhaps, researcher to make a clear distinction between the particular problem which is the subject of this paper and some other current problems in the general area. Such distinctions probably aid analysis, though it should not be forgotten

that, in practice, solutions to many distinct problems may have to be sought simultaneously. Government programs are, to a large extent, 'lumpy' inputs. Continuous 'marginal adjustment' is rarely politically feasible.

One easily distinguishable problem, which is causing us considerable concern in Canada at the present time, is shortages of funds on the supply side of long-term farm mortgage credit. The development of potential private sector sources, which would ease rapidly growing demands on the public purse in these times of fiscal restraint, has become a priority in this country.

Two other types of problem which have received some attention in the farm credit literature are perhaps less readily distinguishable from our 'timing' problem because potential solutions to them also appear to lie in changing the conventional terms and conditions associated with farm mortgage loans. These are:

- a) Problems deriving from a fluctuating rate of inflation when the interest rate remains fixed.

Such problems have been discussed by Ross (1977), Lee (1979) and others. Major undesirable effects of a fixed interest rate are windfall losses to the lender if the inflation rate increases and windfall losses to the borrower if it falls. Such problems seem likely to be largely overcome in future by the introduction of '5-year (or even more frequently) renewable' interest rates.

- b) Problems deriving from short-term and cyclical fluctuations in farm incomes (due to weather-induced yield variations, market price fluctuations, etc.).

This type of problem has been discussed by Lee (1979), and Baker (1977), for examples. In Canada, at least, the problem appears to be largely overcome in practice by the flexibility in payments allowed by the F.C.C. In low income years payments may be deferred. The practice of charging penalty (premium) interest rates on overdue payments has recently been discontinued.

Baker suggested a more formal solution to this problem in the form of variable (product price indexed) payment mortgages.

Both the above are problems of economic instability. In contrast, the 'timing' problem, which is the focus of this paper, would continue to exist even under conditions of complete stability in weather and farm product prices. It is a problem associated with long-term structural adjustment in the farm sector. At the individual level, all three problems will tend to be more severe for farmers with higher debt/equity ratios including, in particular, many starting farmers.

Some other agricultural policy problems may find their solution through the farm credit mechanism. One already alluded to in this paper is the speculative risk involved in the farm real estate purchase. Some authors have suggested that the credit institutions or governments should absorb some of that risk (e.g. via variable mortgages indexed according to average farm land price movements as proposed by Ross [1977]).

In the next section of this paper the discussion focuses solely on possible solutions to the 'timing' problem as defined in this paper.

IV POLICY ALTERNATIVES

Governments can and do treat the symptoms of the farm mortgage credit timing problem by increasing the opportunities open to young farmers to phase into full-time farming gradually by renting land on which they have a purchase option while building up their personal equity.

Examples in Canada of such programs involving public ownership of farm land are the Saskatchewan Land Bank and the Prince Edward Island Land Development Corporation. Governments may also act in various ways to facilitate part-time farming as a means to entry. Furthermore, they may attempt, albeit at considerable risk of losing on the land price swings what they gain on the other price roundabouts, to ease the burdens of starting farmers by directing various types of subsidies at them, including credit subsidies.

However, discussion in this section will be restricted to some possible alternative non-subsidy cures of the timing problem rather than such other palliatives to it.

Increased length of term for level payment mortgages

In my view, this option may be dismissed rapidly. Annual payments on a \$100,000 loan at 10 percent, for example, would be \$10,610 with a 30-year term, \$10,230 with a 40-year term, and \$10,090 with a 50-year term. The 5 percent reduction in annual payment which a change from a 30-year term to a 50-year term would make possible would translate into a 5 percent increase in the "maximum affordable loan" in the earlier example, making it equivalent to roughly 39 percent rather than 37 percent of the total purchase price, - clearly a rather insignificant gain.

Formal (and equally rigid) alternatives to the level payments plan

As Lee (1979) has inferred the theoretical possibilities are endless. Obviously, the nature of the timing problem restricts our interest to that subset of alternatives which incorporate lower payments (nominal terms) in the earlier years and higher payments in the later years.

Note that a feature of all such alternatives is that the amount owing rises over time before falling, while, with a level payments plan, it is reduced continually from year 1 on. It may be useful to further divide this subset into two groups depending on whether the terminal (year 30) payment is significantly higher than the preceding years' payments or not. In practical terms this translates into a distinction between those mortgage payments plans which (like the level payments plan) require the full debt to be cleared within the farming lifetime and those which allow for the possibility of part of the debt repayment being delayed until it can be met using part of the proceeds from the sale of the farm. In both cases a few selected options will be examined from the points of view of how well they fit the time pattern of returns to the farm real estate investment, and what size of "maximum affordable loan" they would allow, using the assumptions and numbers of the earlier 'typical' farm purchase example. Note that the 10 percent annual interest rate and 30-year term apply to all such illustrations of the various selected alternatives.

1. Options with no large terminal payment. Three such options, all termed 'graduated payments' options, are considered. The time profiles of annual payments, under the "maximum affordable loan" situation for each, are illustrated (on a logarithmic scale for convenience) in Figure 4. Essential features of each of these three options are as follows:

- a) Graduated Payments Option 'A'

Payment is 5 percent of amount owing in year 1, 6 percent in year 2, 7 percent in year 3, 8 percent in year 4, 9 percent in year 5 and 10 percent in year 6, by which time the amount owing has risen to 1.159 times the original amount of the loan. This amount is then amortised over the remaining 24 years at 10 percent,

resulting in level payments for the remainder of the term (see Table 4). In the example situation, the maximum affordable loan under such a plan would be approximately \$116,000 or 58 percent of the total investment, with the expected annual return equalling (constraining the size of) the loan payment in year 6.

(b) Graduated Payments Option 'B'

Payment is 1 percent of amount owing in year 1, 2 percent in year 2, and so on rising to 10 percent in year 10. In year 11, interest payment is 10 percent and the amount owing is reduced by 1 percent. Starting in year 12, the amount then owing, equal to 1.532 times the original loan, is amortized at 10 percent for level payments over the remaining 19 years. This plan would allow a maximum loan of approximately \$134,000 or 67 percent of the total investment in the example situation. Loan payment would equal expected annual rental return in year 10.

(c) 'Pure' Graduated Payments Option

The word 'pure' is used here to signify a graduated payment option in which the annual payment increases continually over the full term of the loan. Lee (1979) has already discussed graduated payment plans characterized by annual payments which rise over time by a constant proportional amount. The option used here is taken directly from Lee's Table 4 (p. 16), and is that in which the annual payment rises by 8 percent per year. With a 30-year term, a 10 percent rate of interest and a loan of \$1, the first payment would be \$0.047245 and the last payment \$0.440196. In our example, this plan would allow a maximum affordable loan of approximately \$165,000 or 82.5 percent of the total investment, with the annual rental return in year 1 providing the active constraint.

2. Options with large terminal payments

Again, three such options are considered. They are termed here 'deferred payments' options. Their time profiles are compared, on a logarithmic scale, to the time profile of expected annual rental returns (plus farm sale receipts in year 30) for the example purchase situation, using the "maximum affordable loan" in each case, in Figure 5. The principal features of each of these three options are:

a) Deferred Payments Option 'a'

Annual payment is 8 percent of the amount owing in all years. Since the interest rate is 10 percent, it follows that the amount owing increases by 2 percent per year. The maximum affordable loan under such a plan in the example situation is roughly \$94,000 or 47 percent of the total investment. The annual payment is \$7,520 in year 1, \$13,348 in year 29, and the year 30 terminal payment is \$183,864 (see Table 4).

b) Deferred Payments Option 'b'

The structure of this plan is similar to the preceding one except that annual payments are set at 4 percent of the amount owing, which means that the latter increases by 6 percent per year. Under this plan the maximum affordable loan becomes \$194,000 or 97 percent of the total investment, in round figures. Then the annual payments would rise from \$7,760 in year 1 to \$42,098 in year 29, with a terminal payment of \$1,158,762 in year 30 (Table 4).

c) Graduated/Deferred Payments Option

Such an option combines features of the previous graduated and deferred plans. In the specific option illustrated here, payments begin in year 1 at 4 percent of the amount owing and rise over time as a percent of the amount owing by 0.2 percent per year, so that by year 29 the payment represents 9.6 percent of the amount then owing. This plan allows a maximum affordable loan of \$188,000, or 94 percent of the farm purchase price, in round figures. With such a loan the first annual payment would be \$7,520, the year 29 payment \$44,744, and the terminal payment \$513,616 (Table 4).

Of the six options specified above, only three succeed in bringing the 'maximum affordable loan' up into the 80 percent plus range. These are the 'pure graduated', 'deferred b' and 'graduated/deferred' options. In addition, the 'graduated b' option, or something like it, may warrant further consideration in that (a) it does allow a significantly higher maximum loan (67 percent) than the level payments option, (b) its features of initially rising but later level annual payments make it somewhat similar to government-sponsored Graduated Payment Mortgages already in operation in the residential mortgage market in Canada (through the Canada Mortgage and Housing Corporation (C.M.H.C.)), and (c) its very low payments in the early years may make it very suited to the establishment of farming operations in situations typically characterized by early cash flow difficulties.

The 'pure graduated' option allows a maximum affordable loan of 82.5 percent without requiring a large terminal payment; i.e. it is still consistent with the notion of a debt-free farm by the time of retirement. This may be seen as an advantage, particularly by a lender. On the other hand, because the time profile of annual payments is closer to the time profile of expected (average year)

rental returns in this option than in the others, the lender should also expect there to be more years in this case when the annual payments can not be met, given a normal pattern of farm income fluctuations.

The terminal payment required under the 'graduated/deferred' option (\$513,616) is still only in the order of 10 percent of expected farm sale receipts in the same year. Furthermore, this option would permit borrowing up to 94 percent of the farm purchase price. A disadvantage may be that its mechanics may be somewhat less easily understood by the average farmer. The 'deferred b' option is simpler but has a considerably larger terminal payment requirement.

Increased Flexibility (decreased rigidity)

In essence, increased flexibility means widening the available payment options; i.e. saying to the borrower that, to an extent (within limits), he may choose whichever payment plan alternative best suits him. In the extreme, it could be indicated that the term is 30 years, the interest rate is 10 percent, and all the above and other conceivable options are open to him: he may pay interest and principal as he sees fit, with any unpaid interest being added to the principal owing and the accumulated amount owing becoming due at the end of 30 years. Limiting the rate at which, ^{or} ~~on~~ the amount to which, the amount owing is allowed to increase, - perhaps specified in terms of a percentage of the market value of the security, - is a condition which might be imposed to make this degree of flexibility more workable in practice.

I expect that the initial judgement of most people would be that, faced with such freedom, farmers would be inclined to make no payments but, rather, would tend to adopt 'leverage-maximising' behavior in using the cash saved for equity deposits on further land purchases, resulting, in turn, in more rapid overall consolidation of farm resources into fewer and larger units.

However, such a judgement is inconsistent with the frequently stated observation that farmers are strongly motivated to increase their percentage equity situation and even to achieve a debt-free status for their farm operation; that farmers, like lenders, are very risk averse, and reluctant to put themselves in a situation where a few bad years for farm prices could mean for them a loss of all their assets. There is some compelling evidence to support this observation. For instance, in recent years about one half of the principal payments received by the F.C.C. in Canada have been voluntary pre-payments.¹⁴

It would be naive to assume that all farmers could be slotted into the same stereotype, and undoubtedly there will always be some more adventurous risk-takers who are strongly motivated towards growth. In these days of widely-shared personal credit information, a limit on the amount of (government provided or insured) credit provided to any individual farmer could be readily enforced. It is not at all self-evident to me that a liberalization of the payment conditions associated with farm mortgage loans would, over the longer run, result in a marked decrease in the rate of turnover of such funds, a marked increase in the overall debt to asset ratio in farming or a marked increase in the 'pot' of long-term credit needed to service farmers' needs. Gradual changes in these directions are to be expected even if the available farm mortgage credit alternatives are not rejuvenated.

It appears that most suppliers of conventional level payment farm mortgage loans in Canada already allow virtually complete flexibility of payment on the pre-payment side. However, the 'timing' problem underlined in this paper points to the need for flexibility to defer part of early year payments under such a plan. While the major long-term farm lenders do tolerate some flexibility on the 'down'

side, it is designed to cope with the problems of fluctuating farm incomes and 'poor' years and falls well short of allowing the possibility of a sustained departure from the conventional level payments plan.

The consideration of increased flexibility as an alternative cure to the timing problem in its own right hopefully underlines that, in looking at the various formal alternatives to level payments plans, such as those discussed and illustrated above, we should not be seeking a (single) replacement for the level payments plan, but rather should be asking which of the others could be offered in addition to the more conventional mortgage.

V TERMINAL PHILOSOPHY

It would appear that, for the many farmers who need credit to supplement an already sizeable amount of personal equity capital in a farm investment, and who are willing to accept deferred returns on that equity investment, the conventional level-payments mortgage loan will continue to fill an important role as a credit vehicle. However, for those farmers, including many starting farmers, who wish to rely on credit as the predominant source of finance for the farm investment the level-payments mortgage is beginning to appear to be a relic of the days when farms were expanding their capital only slowly and inflation could almost be disregarded.

The environment for farming has changed significantly. In the light of the present outlook for future energy prices, the propensity of today's governments for deficit budgets, etc., it appears as if current rates of inflation will be with us for many years yet, and stand a good chance of coming to be regarded as the norm. Similarly, there seems to be no good reason to believe that appreciation in the value of farm real estate (in real terms) and substitution of capital for labour in agriculture will not continue.

Thus the 'timing' problem will continue to get worse so long as we rely solely on the level-payments option as a vehicle for farm mortgage credit. Inevitably, this problem will, in time, induce its own solutions. One would likely come in the form of more rapidly increasing reliance on non-operator equity capital to finance farming rather than credit. Another strong possibility is a more rapid swing towards renting of land by farm operators, and the possibility of a dominantly landlord-tenant system. Both these 'solutions' represent separation of ownership from the farm operator, and thus may be seen by many as representing an undermining of the family-farm agriculture which they value.

The alternative would appear to be to bring some imaginative new innovations into the farm credit system which will allow it to fully meet the needs of a starting farmer in a modern agriculture, and under inflation conditions such as we have seen in the 'seventies'. Many payment plan options exist, some of which appear to be much more suited to the typical time pattern of returns to the farm real estate investment.

However, simplistic figuring such as was done in this paper is only a start. Alternatives should be tested for their compatibility with the whole farm financial management system (including taxation aspects) in real farm situations. Behavioral response and preferences of farmers faced with such new alternatives need to be tested under limited-scale trial conditions. Cognisance needs to be taken of other potential or imminent improvements in the farm credit system (e.g. regularly renegotiable interest rates or government insurance of commercial sector farm mortgage loans) to ensure that simultaneous changes are mutually compatible. A major consideration for governments must be the possible implications of new credit policies for farm land prices, although the non-subsidy options discussed in this paper would, at least on the surface, appear to hold less danger of significant impact in this regard.

The point of view of the borrower has dominated the current discussion. Clearly, questions of practicality, legality and risk for the financial institutions also need to be researched. It may well be that some of the payment plan options represent a higher investment risk for the lender and, therefore, that they should only be offered at a higher rate of interest. Variable interest rates as between different plans at any given point in time would, in turn, reduce the practicality of offering the borrower complete flexibility to switch between plans over time.

The reasoning of this paper depends heavily on the initial conclusions, based on a rapid review of published empirical evidence, that normal rates of annual rental returns to farm real estate and of appreciation in the market value of that real estate can both be expressed realistically as constant percentages of the current market value of that real estate, and that appropriate numbers are 3.5 percent, and 3.5 percent above the prevailing rate of general price inflation, respectively. In order that they can validly be expected to be taken seriously, the conclusions of this paper need to be examined for their sensitivity to changes in these basic numbers, and the empirical basis for the numbers more thoroughly validated. The paper is, therefore, somewhat tentative.

Much remains to be done, but I believe that we can look forward to considerable action in the farm mortgage credit area in the next few years.

TABLE 1: Average value of total farm capital and of land and buildings per census farm, in constant (1976) dollars, Canada, census years 1961-1976

	1961	1966	1971	1976
Consumer Price Index (1976=100)	50.4	56.1	67.2	100.0
Number of Census Farms	480,903	430,522	366,128	338,578
Value of Total Farm Capital (\$m)	13,171	19,075	24,068	57,056
T.F.C. per farm (\$ current)	27,389	44,307	65,736	168,516
T.F.C per farm (\$1976)	54,343	78,979	97,822	168,516
Value of Land & Buildings (\$m)	8,623	13,174	16,936	43,556
L. & B. per farm (\$ current)	17,930	30,600	46,257	128,645
L. & B. (\$ 1976)	35,575	54,545	68,835	128,645

Source: Statistics Canada, "Census of Agriculture" and "Consumer Price Index".

TABLE 2: Expected value of farm real estate (purchase price \$200,000), expected annual rental returns to that farm, and annual loan payments for a conventional mortgage loan of various amounts, for each year in a 30 year farming horizon.*

Year	(a)	(b)	(c)	Payments on conventional 30 year mortgage loan when amount borrowed is		
	Appreciated value of \$1 (= $(1.115)^t$)	Appreciated value of \$200,000 (= $(a) \times 200,000$)	Annual Rental returns (= $(b) \times .035$)	\$1	\$180,000	\$73,560
1	1.115	223,000	7,805	.1061	19,098	7,805
2	1.243	248,600	8,702	.1061	19,098	7,805
3	1.386	277,200	9,702	.1061	19,098	7,805
4	1.546	309,200	10,822	.1061	19,098	7,805
5	1.723	344,600	12,061	.1061	19,098	7,805
6	1.922	384,400	13,454	.1061	19,098	7,805
7	2.143	428,600	15,001	.1061	19,098	7,805
8	2.389	477,800	16,723	.1061	19,098	7,805
9	2.664	532,800	18,648	.1061	19,098	7,805
10	2.970	594,000	20,790	.1061	19,098	7,805
11	3.311	662,200	23,177	.1061	19,098	7,805
12	3.692	738,400	25,844	.1061	19,098	7,805
13	4.117	823,400	28,819	.1061	19,098	7,805
14	4.590	918,000	32,130	.1061	19,098	7,805
15	5.118	1,023,600	35,826	.1061	19,098	7,805
16	5.707	1,141,400	39,949	.1061	19,098	7,805
17	6.363	1,272,600	44,541	.1061	19,098	7,805
18	7.095	1,419,000	49,665	.1061	19,098	7,805
19	7.911	1,582,200	55,377	.1061	19,098	7,805
20	8.821	1,764,200	61,747	.1061	19,098	7,805
21	9.835	1,967,000	68,845	.1061	19,098	7,805
22	10.966	2,193,200	76,762	.1061	19,098	7,805
23	12.227	2,445,400	85,589	.1061	19,098	7,805
24	13.633	2,726,600	95,431	.1061	19,098	7,805
25	15.201	3,040,200	106,407	.1061	19,098	7,805
26	16.949	3,389,800	118,643	.1061	19,098	7,805
27	18.898	3,779,600	132,286	.1061	19,098	7,805
28	21.072	4,214,400	147,504	.1061	19,098	7,805
29	23.495	4,699,000	164,465	.1061	19,098	7,805
30	26.197	5,239,400	183,379	.1061	19,098	7,805

* Assumptions: - Annual rate of appreciation of market value of farm real estate = 11.5%..
 - Annual rental return = 0.035 x current market value of farm.
 - Interest rate on farm mortgage loan = 10%.

Note: Figures approximate due to rounding.

TABLE 3: Time stream (first 15 years only) of expected annual rental returns from an initial farm investment of \$2,000, and of the excess of these returns over annual payments on a 30 year mortgage loan of \$1,000, under three different assumptions about the inflation rate and corresponding interest rate*.

Inflation Rate Interest Rate Year	3% 5%		8% 10%		13% 15%	
	Expected Annual Rental Returns	Subtract Loan Payment \$65	Expected Annual Rental Returns	Subtract Loan Payment \$106	Expected Annual Rental Returns	Subtract Loan Payments \$153
1	74	9	78	-28	82	-71
2	80	15	88	-18	94	-59
3	85	20	98	-8	110	-43
4	90	25	108	2	128	-26
5	96	31	121	15	150	-3
6	102	37	134	28	176	23
7	108	43	150	44	204	51
8	116	51	168	62	238	85
9	124	59	186	80	276	123
10	132	67	208	102	322	169
11	140	75	232	126	376	223
12	150	85	258	152	438	285
13	160	95	288	182	510	357
14	170	105	322	216	594	441
15	180	115	358	252	692	539

* Assumptions: - Annual rate of appreciation of market value of farm real estate = inflation rate + 0.035
 - Annual rental return = 0.035 x current market value of farm

Note: Figures approximate due to rounding.

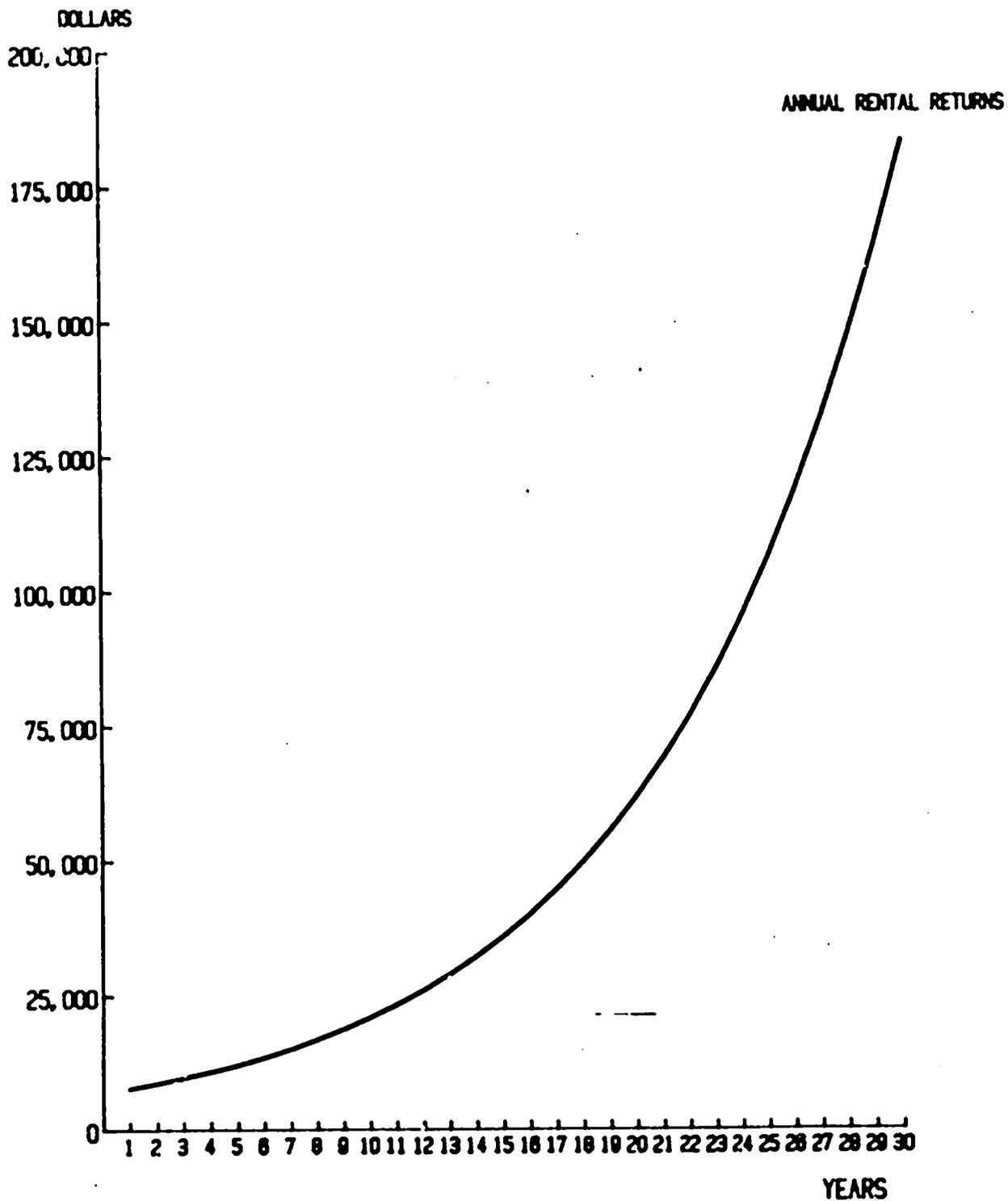
TABLE 4: Annual payments during a 30 year term under five alternative farm mortgage loan plans

Alternative*	"Graduated a"		"Graduated b"		"Deferred a"		"Deferred b"		"Graduated/Deferred"	
	\$1	\$116,000 (58%)	\$1	\$134,000 (67%)	\$1	\$94,000 (47%)	\$1	\$194,000 (97%)	\$1	\$188,000 (94%)
Year										
1	.050	5,800	.010	1,340	.080	7,520	.040	7,760	.040	7,520
2	.063	7,308	.022	2,948	.083	7,802	.045	8,730	.047	8,863
3	.076	8,816	.035	4,690	.085	7,990	.048	9,312	.052	9,776
4	.090	10,440	.050	6,700	.087	8,178	.050	9,700	.057	10,716
5	.103	11,948	.067	8,978	.088	8,272	.054	10,476	.063	11,844
6	.116	13,456	.084	11,256	.090	8,460	.057	11,058	.069	12,972
7	.129	14,964	.102	13,668	.092	8,648	.060	11,640	.075	14,100
8	.129	14,964	.120	16,080	.094	8,836	.064	12,416	.082	15,416
9	.129	14,964	.138	18,492	.096	9,024	.068	13,192	.088	16,544
10	.129	14,964	.155	20,770	.098	9,212	.072	13,968	.095	17,860
11	.129	14,964	.170	22,780	.099	9,306	.076	14,744	.103	19,364
12	.129	14,964	.183	24,522	.101	9,494	.080	15,520	.110	20,680
13	.129	14,964	.183	24,522	.104	9,776	.085	16,490	.118	22,184
14	.129	14,964	.183	24,522	.106	9,964	.090	17,460	.125	23,500
15	.129	14,964	.183	24,522	.108	10,152	.096	18,624	.133	25,004
16	.129	14,964	.183	24,522	.110	10,340	.102	19,788	.141	26,508
17	.129	14,964	.183	24,522	.112	10,528	.108	20,952	.150	28,200
18	.129	14,964	.183	24,522	.114	10,716	.114	22,116	.158	29,704
19	.129	14,964	.183	24,522	.117	10,998	.121	23,474	.166	31,208
20	.129	14,964	.183	24,522	.119	11,186	.128	24,832	.174	32,712
21	.129	14,964	.183	24,522	.121	11,374	.136	26,384	.182	34,216
22	.129	14,964	.183	24,522	.124	11,656	.144	27,936	.190	35,720
23	.129	14,964	.183	24,522	.126	11,844	.153	29,682	.198	37,224
24	.129	14,964	.183	24,522	.129	12,126	.162	31,428	.205	38,540
25	.129	14,964	.183	24,522	.131	12,314	.172	33,368	.213	40,044
26	.129	14,964	.183	24,522	.134	12,596	.182	35,308	.220	41,360
27	.129	14,964	.183	24,522	.137	12,878	.193	37,442	.226	42,488
28	.129	14,964	.183	24,522	.139	13,066	.204	39,576	.233	43,804
29	.129	14,964	.183	24,522	.142	13,348	.217	42,098	.238	44,744
30	.129	14,964	.183	24,522	1.956	183,864	5.973	1,158,762	2.732	513,616

*See text for definition and explanation of alternatives.

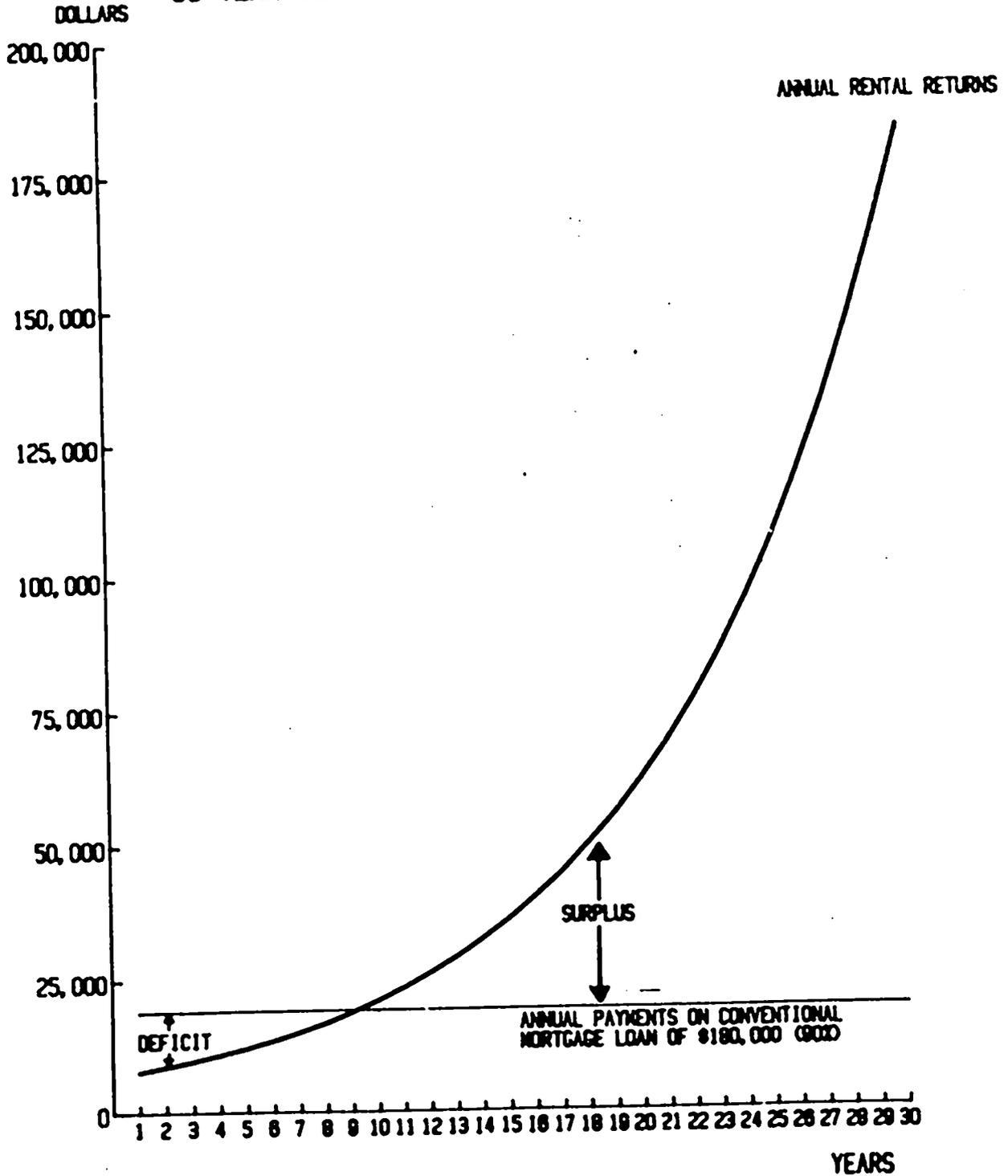
Note: Figures approximate due to rounding.

FIGURE 1: TIME PROFILE OF EXPECTED ANNUAL RENTAL RETURNS TO THE HYPOTHETICAL FARM REAL ESTATE INVESTMENT OF \$200,000, UNDER THE ASSUMPTIONS OUTLINED IN THE TEXT.



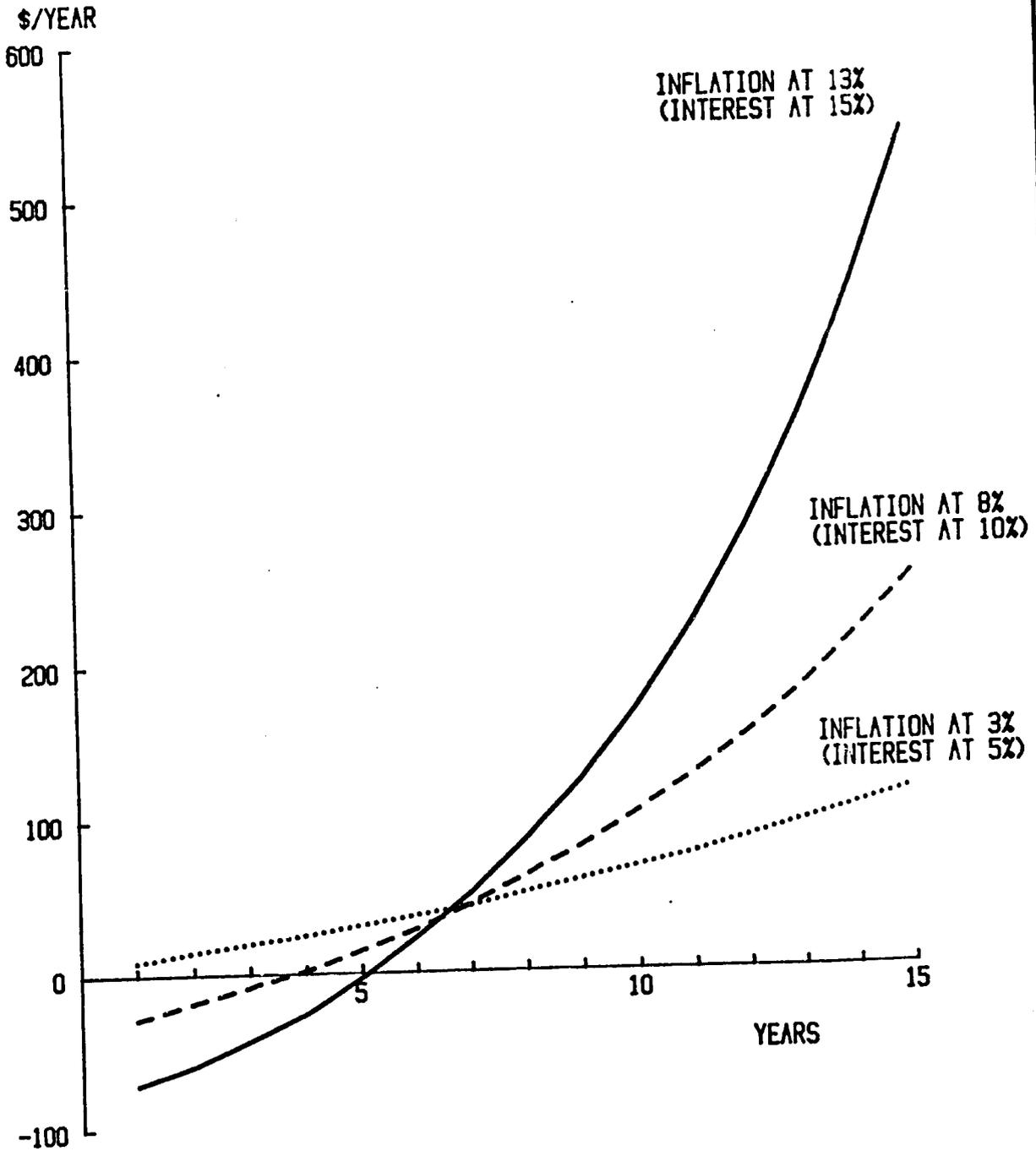
SOURCE: TABLE 2

FIGURE 2: TIME PROFILES OF EXPECTED ANNUAL RENTAL RETURNS TO THE \$200,000 FARM REAL ESTATE INVESTMENT AND OF ANNUAL PAYMENTS ON \$180,000 MORTGAGE LOAN (10% INTEREST, 30-YEAR TERM)



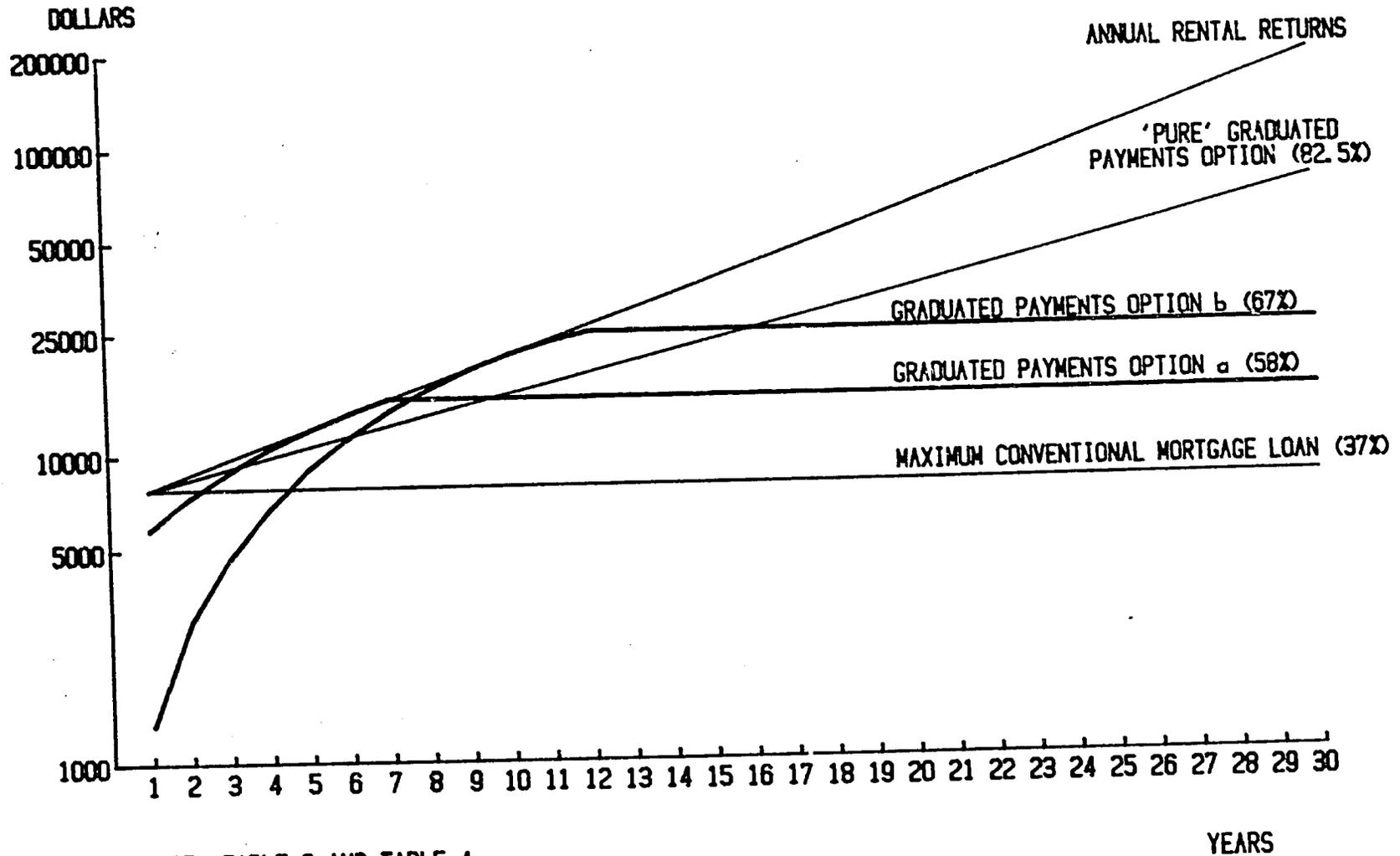
SOURCE: TABLE 2

FIGURE 3: EXCESS OF EXPECTED ANNUAL RENTAL (FARM REAL ESTATE PURCHASED FOR \$2000 OR MULTIPLES THEREOF) RETURNS OVER ANNUAL FARM MORTGAGE LOAN (\$1000 OR CORRESPONDING MULTIPLES) PAYMENTS UNDER THREE DIFFERENT INFLATION RATES, FIRST 15 YEARS OF 30 YEAR TERM



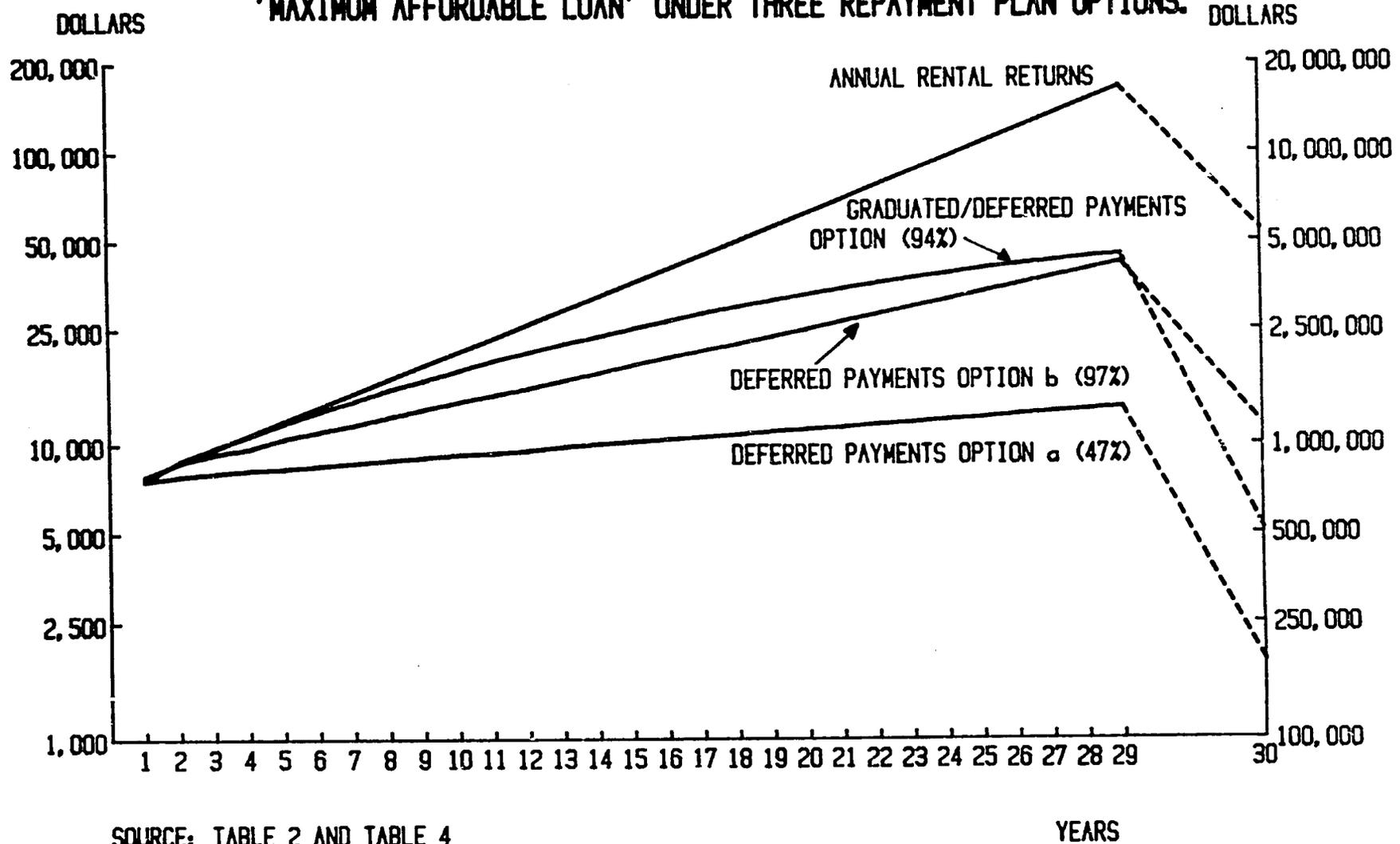
SOURCE: TABLE 3

FIGURE 4: TIME PROFILES OF EXPECTED ANNUAL RENTAL RETURNS TO THE FARM REAL ESTATE INVESTMENT AND OF ANNUAL PAYMENTS REQUIRED BY THE 'MAXIMUM AFFORDABLE LOAN' UNDER FOUR REPAYMENT PLAN OPTIONS.



SOURCE: TABLE 2 AND TABLE 4
 NOTE: SEMI-LOGARITHMIC SCALE

FIGURE 5: TIME PROFILES OF EXPECTED ANNUAL RENTAL RETURNS TO THE FARM REAL ESTATE INVESTMENT (INCLUDING FARM SALE RECEIPTS IN FINAL PERIOD) AND OF ANNUAL AND TERMINAL PAYMENTS REQUIRED BY THE 'MAXIMUM AFFORDABLE LOAN' UNDER THREE REPAYMENT PLAN OPTIONS.



SOURCE: TABLE 2 AND TABLE 4
 NOTE: SEMI-LOGARITHMIC SCALE

FOOTNOTES

- 1/ In support of this one might cite, for examples:
- (a) The titles of some professional journal articles: - "How young men are getting started in farming" (Cavert, 1954); "Increased capital requirements and the problem of getting started in farming" (Van Vliet, 1958); "Financing capital requirements of young farmers" (Brown, 1975) and "Issues related to the entry of young people into farming" (Hottel and Barry, 1978).
 - (b) Several other professional papers in which the topic has been discussed.
 - (c) A 1977 Special Report on a survey of agricultural bankers, conducted by the American Bankers Association, which showed the financing of young farmers to be their first concern (cited in Hottel and Barry, 1978).
 - (d) The fact that several papers on the theme "The beginning farmer - A right to credit?" were included in the program of the 1975 Agricultural Credit Conference of the Canadian Bankers Association.
 - (e) the unsuccessful proposals for a "Young Farmer's Homestead Act" which were before the U.S. Congress in the 1975/76 period. [REDACTED]
 - (f) Some conclusions and recommendations of the Saskatchewan Royal Commission on Agriculture and Rural Life (1955) in its third report entitled "Agricultural Credit", such as - "Present credit sources are considered to be ill adapted to the needs of ... beginning farmers" (p. 91) and "... special provision should be made to meet the needs of beginning farmers" (p. 94).
- 2/ For example, Breimyer (1977), who wrote, - "...as... the price of land goes up, it becomes harder for an operating farmer to own the land he farms. It especially becomes harder for a young farmer to own land. The cost of land is a major obstacle to entry as an owner-operator".
- 3/ FCC's maximum loan per applicant was raised from \$55,000 to \$100,000 in 1972, to \$150,000 for farmers under 35 in 1975, and to \$200,000 (all ages) in 1978. Loan limits expressed in terms of percentage of the appraised value of the security offered are also imposed. Currently this limit is set at 100 percent for all farmers; previously it had been 90 percent for young farmers and 75 percent for others, and prior to that 75 percent for all farmers. Twenty years ago it was 65 percent. "Appraised" value now means "market" value, but until recently was interpreted as "productive" value.

FOOTNOTES (2)

- 4/ F.C.C. (1978) Tables 21 and 22.
- 5/ T. Kremeniuk, F.C.C., pers. comm. (unpublished data).
- 6/ For examples: Gilson (1973), Anderson (1967), Pilmer (1976).
- 7/ A few seem to be disinclined to acknowledge capital gains to be an investment return or income at all. Such a view tends to lead to various analyses showing that agricultural land prices are 'unjustifiably high', to the use of concepts like agricultural productive 'value' (being lower than market value), to over-emphasis on non-monetary satisfactions derived from land ownership, etc. etc.
- 8/ Ross (1977) proposed a mechanism for the 'indexation' of farm real estate mortgages in line with average changes in the price of farm land. Such a mechanism would have the effect of transferring some of the speculative risk of farm land purchase to the supplier of credit. Where farmers rent publicly-owned land on the basis of long-term leases (e.g. from land banks) this speculative risk is, of course, avoided by the farmer.
- 9/ See for example, Reinsel and Johnson (1970) and various provincial and state level reports. A recent informal survey in Canada also supports this statement.
- 10/ See, for example O.E.C.D. (1970, Table 11) and Johnson (1970). The 4 percent average rate implicit in the O.E.C.D. data for Canada covers all farm capital. If returns at commercial rates are imputed to non-real-estate capital, the residual rate of return on farm real estate becomes somewhat less than 4 percent. Similar and other adjustments need to be made to the rates of return on equity capital derived from the U.S.D.A.'s "Balance Sheet of the Farming Sector" and reported by Hottel and Reinsel (1976) if they are to be properly interpreted in the present context. However, these returns, which were in the range of 0 to 6 percent per year for each year during the 1960-75 period (except 1973 when the figure was 10.7 percent), provide a useful indicator to the general level of returns to farm real estate, given the importance of equity capital as a source and real estate capital as a component, of total farm capital.
- 11/ In the U.S., Doving (1977) (cited by Sonka (1978)) concluded that the price of farmland in Illinois tends to increase at twice the rate of the Consumer Price Index (C.P.I.). In my view, available evidence suggests that the rate of farm land value appreciation is related to the general inflation rate but is not a simple multiplier of it. Johnson and Janssen (1978) present data which suggest that constant dollar rates of farm real estate wealth appreciation in both Michigan and Nebraska averaged 3.3 per cent per year between 1950 and 1976. Crowley (1974) reported average

FOOTNOTES (3)

compound rates of increase (current dollars) in farm real estate values, between 1963 and 1973, across all U.S. states of 6.9 percent per year; - implying a rate of gain in real terms of about 3 percent per year. Likewise, Johnson (1970) found an average real rate of capital gain in the value of farm real estate (all U.S.) during the period of the 1960's of 3 percent per year.

In Canada, Huff and Cusack (1972) studied capital gains in agriculture between 1946 and 1966. Real rates of capital gains in farm real estate value implicit in their figures averaged 2.3 percent per year over the whole period and 4.3 percent between 1960 and 1966. The normal rates of gain on bare farm land on the Canadian Prairies of 14 to 20 percent per year during the early sixties found by Ablasser (1969) suggest real rates of appreciation somewhat higher than revealed by Huff and Cusack's data, even after adjustment to an all farm real estate basis. Analysis of the average farm land price series of Statistics Canada between 1962 and 1977 shows that farm land prices rose on average at a rate 4 percent higher than the farm input price index and 5 percent higher than the C.P.I. over this period (F.C.C. (1978), Tables 32 and 36). These latter figures need to be refined by adjustment for estimates of capital improvements made to the land.

- 12/ This condition is not as unrealistically strict as may at first appear, since the payment deferral tolerance which most lending agencies seem to show is designed to accomodate variability of net returns in farming. Our example abstracts from such short-term and cyclical instability in prices and yields, - see discussion p.14.
- 13/ Pilmer (1976) made a somewhat similar calculation for a hypothetical mid-west U.S. cropping farm. In his example, and under somewhat different assumptions, the maximum farm purchase loan level supportable by current farm income levels was 25 percent of market value.
- 14/ T. Kremenik, F.C.C., pers. comm.

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APPENDIX(a) The Farm Purchase Decision Model

Where:

S_n^* = expected farm selling price (current dollars) after n years
(net of any capital improvements planned) of farming.

P = purchase price

d = personal discount rate for farm purchase (the interest rate which could be earned in the best alternative investment adjusted for different risk and personal preference factors.

a_t^* = the expected annual rent return to farm estate in the
tth year.
(t = 1,n)

Then the expected present value of the farm investment will be:

$$V^* = \frac{S_n^*}{(1+d)^n} + \sum_{t=1}^n \left(\frac{a_t^*}{(1+d)^t} \right)$$

If the risk associated with the expectation of appreciation in the value of the farm real estate is higher than the risk associated with the annual rental returns expectations then it may be more appropriate to write:

$$V^* = \frac{S_n^*}{(1+d_1)^n} + \sum_{t=1}^n \left(\frac{a_t^*}{(1+d_2)^t} \right)$$

(where $d_1 > d_2$)

Alternatively again, for similar reasons of differential risk perception, it may be that the farm buyer wishes to use a d which is not constant, but rises over time with t, in which case one could write:

$$V^* = \frac{S_n^*}{(1+d_n)^n} + \sum_{t=1}^n \left(\frac{a_t^*}{(1+d_t)^t} \right)$$

In all cases the decision rule for purchase would be: Purchase if

$$V^* > P$$

(b) The calculation of S_t^* and a_t^* (Table 2)

Table 2 of the main text shows the values over time of S_t^* (column (b)) and a_t^* (column (c)) for all values of t ($t=1, \dots, n$), under the following assumptions:

1. Expected general inflation rate, $r = 0.08$ per year
2. Expected farm real estate price rise, $i = r + 0.035$
 $= 0.115$ per year
3. $a_t^* = 0.035 S_t^*$ for all t ($t=1, \dots, n$)
4. $n = 30$ years
5. $P = \$200,000$

Thus:

$$S_t^* = P(1+i)^t = 200,000 (1.115)^t \quad \text{for all } t \text{ (} t=1, \dots, n \text{)}$$

$$a_t^* = 7,000 (1.115)^t \quad \text{for all } t \text{ (} t=1, \dots, n \text{)}$$

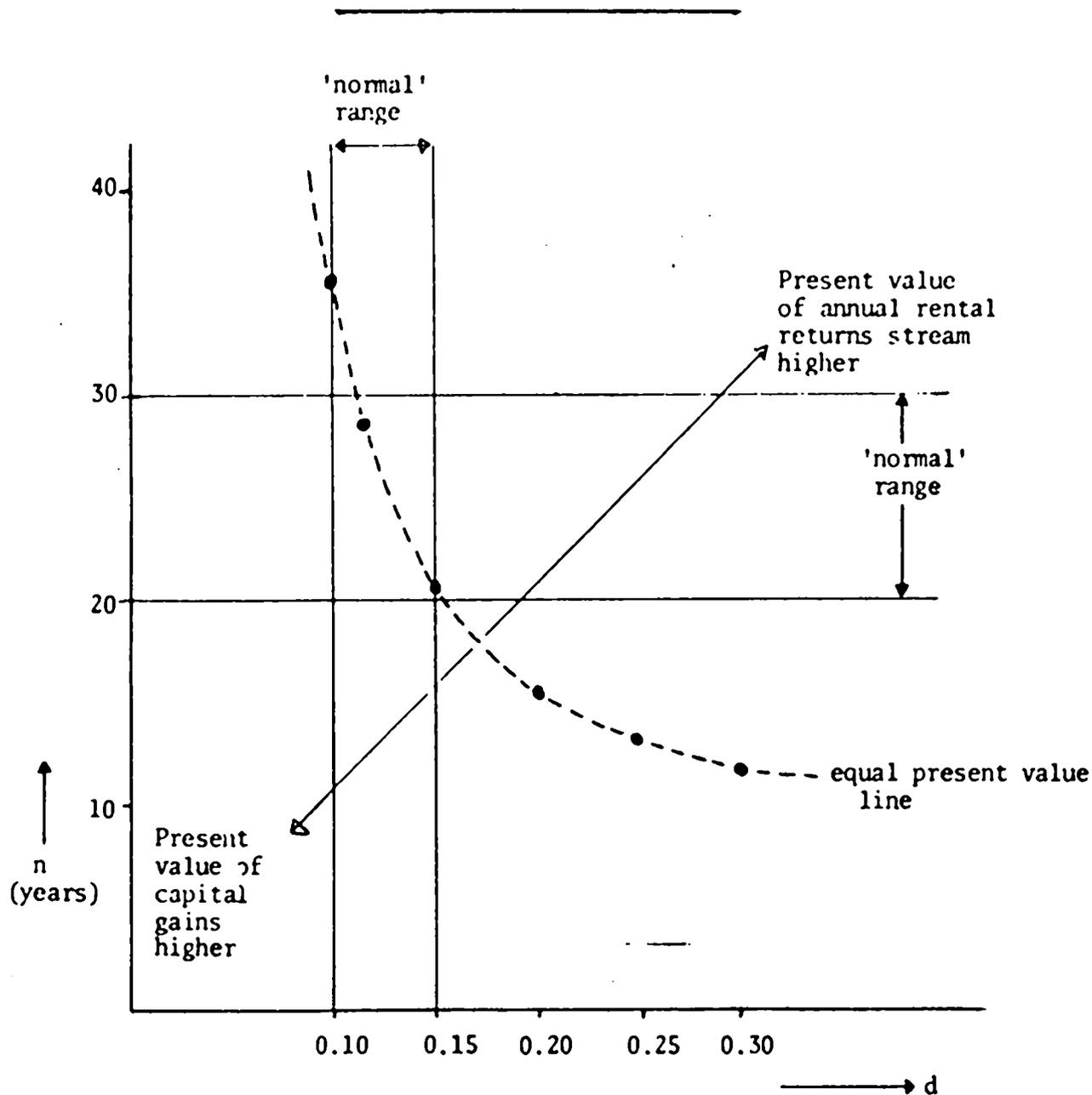
(c) The relative present values of capital gains and of the annual rental return stream

It is interesting to note the conditions, given the above assumptions, under which the present value of the expected capital gains return to the investment is equal to the present value of the expected stream of annual rental returns; i.e.

$$\frac{S_n^*}{(1+d)^n} = \sum_{t=1}^n \left(\frac{a_t^*}{(1+d)^t} \right)$$

A rough guide to the combinations of d and n for which this holds is given in the Appendix Figure. Moving away from this "equal present value" line in the horizontal dimension (i.e. for any given level of n), increasing the level of d results in the present value of the annual rental return stream becoming greater than the present value of the anticipated capital gains, and vice versa. Note that the line cuts right through the area encompassing a 'normal' range of n (20-30 years), and a 'normal' range of

(0.10 to 0.15). In other words, under our assumptions of 'likely' rates of inflation, farm real estate value appreciation, and annual rental returns rates in agricultural production, for the average North American farmer capital gains and the annual rental stream will rank roughly equal in terms of the magnitude of importance of their respective returns contributions to the farm investment.



Appendix Figure : Graph of combinations of n and d which result in the present value of expected capital gains being equal to the present value of the expected stream of annual rental returns, under the assumptions indicated in the text.