

A COMPUTERIZED OWNERSHIP RETIREMENT PLANNING
SYSTEM FOR AGRICULTURAL COOPERATIVES

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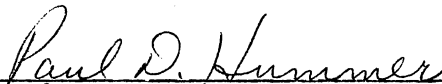
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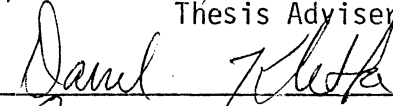
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PREFACE

This study is concerned with the development of a managerial tool to assist cooperatives in solving the problem of repaying the equities of aging, inactive, or deceased members. Much of the research is based on a prior study by Dr. Paul D. Hummer and Joseph Hampton concerning the member equity-age problem among Oklahoma cooperatives. It is hoped that the model will assist agricultural cooperatives toward equitable treatment of the ownership retirement problem in the future and thereby assist the cooperatives to adhere closely to the cooperative principle of service at cost.

To the Department of Agricultural Economics and the Graduate College of Oklahoma State University, I wish to express my appreciation for allowing me to attend graduate school and for providing a research assistantship.

To Dr. Paul D. Hummer, chairman of my graduate committee, go my deepest thanks, without whose infinite patience and diligent support my completion of this thesis in absentia would have been impossible. Additional thanks go to Dr. Robert Oehrtman and Dr. Darrell Kletke for serving on my graduate committee and for their constructive criticism during the development of the simulation model.

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CHAPTER I

INTRODUCTION

The disposition of equities held by inactive cooperative member-patrons is a growing problem for Oklahoma agricultural cooperatives. Two primary factors are involved: (1) failure to retire the equities held by inactive members violates the service at cost and democratic control principles of cooperation [3]; and (2) the tools available to cooperatives for predicting the effects of alternative equity retirement plans are often inadequate.

A. Problematic Situation

A.1 Level of Member Inactivity

Every cooperative member eventually becomes inactive either by (1) switching his patronage to a competitor, (2) moving from the cooperative's service area, (3) retiring from farming, or (4) by death [3]. A recent survey of 18 Oklahoma grain and supply cooperatives shows that a high percentage of the membership was becoming inactive through retirement alone. In 12 of the cooperatives the average age of stockholders exceeded 55 years and only in one was the average age less than 50 years. In 10 of the associations, 25 percent of the members were over age 65. Furthermore, stockholders over age 50 held at least 60 percent of the outstanding equity for each surveyed cooperative [18].

However, the concern over the inactive cooperative member-patron and his equity is not a new phenomenon. Kansas extension personnel reported in 1957 that of the marketing and supply associations active in 1950, nearly half had been organized before 1920. If the original members had been 35 to 40 years old in 1920, then by 1950 they must have been 65 to 70 and probably inactive [22].

Only 10 percent of the Kansas cooperatives in 1950 [22] and 18 percent of the sampled Oklahoma cooperatives in 1972 [18] had definite policies outlining procedures of equity retirement when members become inactive. Furthermore, these policies varied widely from cash redemption of all inactive members' holdings, to revoking voting rights, to simply recognizing that a member no longer patronizes the firm. Many of the surveyed cooperatives were doing little and/or were financially unable to consistently retire the investments of inactive members.

A.2 Implications of Failure to Retire

Equities Held by Inactive Members

Failure to retire the equity and accompanying voting rights of inactive members violates the cooperative principle of democratic control by members as patrons. The violations stem from a shift of control from savings minded patrons to former patrons, now more concerned with earnings on investment [21, p. 55]. Historically, cooperatives often fell away from democratic control by member-patrons because the cooperatives were organized under investor oriented, profit type corporation laws [8, p. 13]. Although most states now have special cooperative laws restricting voting rights to active producers [21, p. 329; 12], the laws often are not enforced.

Failure to retire inactive members' equities also violates the service at cost principle. Service at cost by a cooperative requires returning "all savings on transactions with all patrons, or a specific group of patrons, above the cost of performing such transactions... based upon that year's patronage" [22, p. 6]. Part of the cost of providing service is the use of risk capital supplied by the owners. Cooperatives often raise risk capital by retaining net savings [11, p. 14] and issue stocks or notices of ownership to patrons in lieu of cash refunds.

Every cooperative member is obligated to contribute his share of the risk capital in his cooperative. However, it can be argued that unless a member's equity is not revolved back to that member at some future time then he has received no savings as a cooperative member. Furthermore, he may have been forced to use farm income to pay the taxes on savings which may never be realized. His cooperative association may therefore have some difficulty substantiating service at cost [12].

A cooperative's history of not retiring equities, when coupled with continued "book credit" refunds often weakens the loyalty of the cooperative's members [16]. On the other hand, if all current savings were to be issued in cash to currently active member-patrons, inactive members could be subsidizing active members by supplying a large share of the cooperative's risk capital.

B. The Problem.

The ability to retire cooperative equities depends upon many inter-related factors: (1) the long term schedule of net operating margins;

(2) the yearly variations in net savings; (3) the proportion of net savings retained within the association; (4) the total value of equities eligible for retirement annually; (5) the stock retirement plans the directors are willing to consider; (6) the future internal capital requirements; (7) the incoming members and their volume of patronage; and (8) the sources and restrictions on the use of debt capital. These factors form a complex mix of information and capital movements which cannot be easily analyzed with traditional tools at the disposal of boards of directors. Any proposed equity retirement plan will have advantages and disadvantages. But, unless cooperative directors can estimate future developments and accurately evaluate them, they have very little information with which to form equity retirement policies. Therefore, more sophisticated methods of analysis are needed to help cooperative management evaluate the effectiveness of alternative equity retirement plans under the constraints of the interrelated factors listed above [31].

C. Objectives

The purpose of this study was to develop a procedure to assist agricultural cooperative managers and directors in evaluating equity retirement plans. Specific objectives were as follows:

- (1) Develop a set of alternative equity retirement plans.
- (2) Develop and computerize a simulation model by which the effectiveness of alternative plans for acquiring and retiring equity can be determined.
- (3) Determine and compare, via the above model, the effect over time of selected equity retirement plans on the equity

structure and financial operations of selected cooperatives. Comparative analysis should include variation of assumptions with respect to size and consistency of annual net margins, new member business, and distribution of equity.

- (4) Generally evaluate and discuss the practical usefulness of the model to cooperative management in ascertaining the effect of any selected equity retirement plan on future equity retirement and operations of the cooperative.

D. Procedure

A set of equity retirement plans was developed from those presently in use by cooperative management, from those described in the literature and from suggestions and ideas developed during the research program. A flow chart was constructed to simulate the operation of a cooperative insofar as the retirement of equity was concerned. Yearly margins, amounts of working capital needed, changes in membership makeup, individual member data, payment schedules on existing debts, and the equity retirement plans were exogenous inputs.

The flow chart was computerized using the Fortrain IV computer language. Progress in retiring equities was measured by changes in the coefficient of equity-age,¹ in the average age of the membership, in the distribution of equities within age groups, and in the value of equities held by inactive members and estates.

¹The coefficient of equity-age is the average age of the cooperative's members, weighted by the net equity outstanding to each member. The equation is as follows:
$$C = \frac{\sum_{i=1}^n a_i e_i}{\sum_{i=1}^n e_i}$$
 where C is the equity-age coefficient, a_i is the age of the i th individual, e_i is the net equity held by the i th individual and n is the number of individual members.

The model was tested by using input data from a representative agricultural supply cooperative and comparing the model's predictions with hand calculated values. Separate runs with variations in annual margins, retirement plans, and credit availability provided exemplary output to illustrate the model's capabilities. The data requirements, information provided, and costs of using the model were analyzed to determine the model's practicability as a management tool.

Equity financing in agricultural cooperatives is discussed in Chapter II in conjunction with a review of literature. A brief overview of simulation as an analytical tool is also presented.

CHAPTER II

REVIEW OF LITERATURE

This chapter reviews the types of equity financing currently being used by agricultural cooperatives and reviews previous research concerning retirement of members' equities. A brief summary of simulation as an analytical technique is also included.

A. Sources of Equity Financing

Agricultural cooperatives obtain risk capital from their members by two primary methods: direct capital investments and retained earnings¹ [11, p. 14]. Direct capital investments by members is a common method of raising initial capital for new associations and for an individual to become a voting member. The second method, retained earnings, warrants a more detailed description for purposes of this study.

¹Patronage retains, often confused with retained earnings, are also a method of generating risk capital and are defined as, "those investments made by... specific deductions from advances to patrons based upon physical units handled (bushel, hundred weight, dozen, and so on)" [11, p. 20]. These are not discussed in this thesis because they did not constitute a major source of financing by the Oklahoma cooperatives surveyed by Hummer and Hampton [18]. Similar type cooperatives are expected to be the primary users of the model constructed in this study; however, the model is capable of handling the "patronage retain" sources of financing.

A.1 Retained Earnings

The second method by which agricultural cooperatives obtain risk capital is similar to the process of retaining earnings used by non-cooperative corporations. Just as these latter corporations withhold profits from their stockholders to accumulate capital, cooperatives often retain part of their net margins. Net margins are the excess of proceeds from the sales of farm supplies to members over the cost of supplying such services. However, unlike non-cooperative corporations, a cooperative's net margins are savings by and payable to its member-patrons rather than profits for stockholders as such. Therefore, if these savings or earnings are to be retained as risk capital they are often first allocated among the members based upon each member's patronage, in proportion to total patronage. Then shares of stock or notices of stock credits² are issued in lieu of cash patronage refunds. Over time, each member builds up his own equity in the cooperative, and the association's total equity by allowing his savings to accumulate.

In 1962, of the total equity capital invested in 448 regional farmer cooperatives, 58 percent came from allocated retained earnings [11, p. 14]. The primary criticism of this method of financing is that it alone makes no provision for cashing in those equities at a later date. Consequently, the revolving fund method of equity financing has been employed by some cooperatives to allocate retained earnings to members and regularly redeem them at a later time.

²Stock credits are often used to represent a member's allocated retained earnings. Whenever the accumulated total of stock credits equals or exceeds the value of one share of stock, one share is issued to that member and his total stock credits are reduced by that amount.

A.2 Revolving Funds

A.2.1 The Development of Revolving Funds. Revolving funds evolved from J. P. Danzig's attempts to "hold the growers in line" [8, p. 32]. In 1910, as manager of the California Almond Growers Exchange, he proposed delaying the distribution of cash patronage refunds for three years. Then only those producers who remained active would participate in the distribution, while those who were no longer active or had defected to competitors would receive nothing. Although the purpose was to maintain member loyalty, the process is strikingly similar to present day revolving funds.

Also in the early 1900's, Azuza Citrus Association manager, W. C. Hedrick, discovered that his association's maintenance fund of patronage retains had accumulated an unnecessary surplus [8, pp. 42-43]. He also noticed that many of the original members were no longer producers and he proposed retiring their holdings with the excess maintenance reserves. Unfortunately, a series of poor years depleted the surplus before Hedrick's plan could be implemented.

Around this same period of time, Internal Revenue Service officers were threatening to declare patronage retains and retained earnings taxable as corporate income. Up to that time, cooperative net margins had been interpreted as taxable only when received in cash by members and included in the members' personal tax returns. California Fruit Growers Exchange manager J. L. Nagle, when pressured by I.R.S. officers to disclose when the earnings would be distributed, retorted "in five years" [8, p. 53]. Later he urged changes in his association's by-laws to allow directors discretionary power to retire or redeem retained earnings.

Mounting pressure from tax officials and increasing capital needs forced managers and directors into the search for a solution. J. L. Nagle is generally credited with proposing the first formal plan for continuously financing cooperatives in proportion to patronage [8, p. 49; 21, p. 351].

The Fruit Grower's Supply Company, a subsidiary of the California Fruit Growers' Exchange was expanding its role as the supplier of fruit boxes for the Exchange's local affiliates. According to the plan the exchange would deduct a patronage retain of four cents per marketed box of fruit to purchase stock in the Supply Company for the local cooperatives. This process would continue until all the Supply Company's shares were sold. Then future patronage retains would be used to redeem or purchase the longest outstanding shares. These shares would then be reissued to local associations according to the original purchasing agreement. The dual process of retiring oldest issues and reissuing them to current patrons would result in a continual readjustment toward proportional financing while keeping the Supply Company's total risk capital fixed [8, pp. 49-50]. When the revolving finance plan was implemented it worked so well that the Exchange's local affiliates soon began revolving their own risk capital.

A.2.2 The Operation of Revolving Funds. Revolving funds have three major characteristics: (1) current patrons provide a steady flow of risk capital by allowing their cooperative earnings to be retained within the association; (2) accumulated earnings are revolved back to older members by redeeming the oldest outstanding equities; and (3) over time, members finance their association roughly in proportion to current patronage. When an association decides to use the revolving

finance method the first thing it must do is determine the total capital needed, \$300,000 for example. If the association expects total member savings of \$100,000 per year then this amount is added to a revolving fund until total retains equal \$300,000. Each year certificates or book credits are issued to members in lieu of their cash savings. At the end of the fourth year, rather than adding another \$100,000 to the association's capital structure, that money is used to retire the certificates issued in the first year of the fund's operation. Current patrons receive certificates for the \$100,000 that fourth year, as usual. As long as the association continues to have patronage refunds of \$100,000 per year, and no additional risk capital is required, then its certificate will be revolved every three years [28, pp. 338-341].

A.2.3 Advantages and Disadvantages of Revolving Funds. The advantages of revolving funds have made them popular among cooperatives. Members continuously contribute capital to their association based upon participation and in proportion to the benefits received. Patrons can increase holdings in their association gradually and are not required to make large initial stock purchases at the expense of their farming capital. Ownership remains in the hands of current patrons since their capital contributions are used to redeem oldest certificates [28, p. 342; 13]. The firm's total risk capital remains fixed or grows slowly enough to restrict overexpansion, a common cause for the failure of early associations [7].

However, some cooperative members have criticized revolving plans where excessively long revolving periods have become the rule [8, p. 85]. As the technology of handling farm products and supplies become

more complex the capital requirements of cooperatives are rising [20, p. 223]. At the same time, cooperative members' on-farm capital requirements are increasing for the same reason [1; 8, p. 77]. In associations where increases in capital requirements (including certificates of equity redemption requirements) have exceeded increases in net savings, managers have delayed the redemption of revolving certificates rather than ask for additional direct capital investments by members. As a result, the length of the revolving periods has trended upward [30, p. 37]. When yearly earnings continually fall behind growing capital needs, a managers' efforts to shorten revolving periods may result in insufficient risk capital to finance the cooperative's operations [8, p. 85].

Attempts to acquire debt capital are often frustrated by lenders who will not allow the same degree of leverage on "dated" revolving funds as they will on more permanent or "undated" types of risk capital. In fact some commercial lenders view revolving certificates as loans to the association by its members, even though such certificates are subordinate to all debts. To quote Glen Heitz of the St. Louis Federal Land Bank "Leverage in capital use cannot be successful if it's on a floating capital base" [15].

Cooperative members occasionally push for maturity dates on revolving funds to prevent continually lengthening revolvment periods. Maturity dates effectively prevent overexpansion by enthusiastic directors and dated revolving certificates are accepted as collateral by banks on loans to cooperative members [7]. However, lending institutions almost unanimously classify dated certificates as cooperative association debts [6, p. 111]. Maturity dates may prevent cooperatives

from acquiring sufficient credit, thereby forcing the members to provide a large portion of its financing and forfeiting the benefits of favorable leverage [32, p. 8]. Managers prefer non-dated certificates not only because debt is more easily acquired but because the association cannot be forced to revolve them [32, p. 7]. Some associations have tried to gain the benefits of dated and non-dated certificates by placing maturity dates far into the future. Unfortunately, lenders still view them as debt instruments and the time required for a member to recover his investment is only lengthened.

Another problem is that the revolvment process only approximates proportionality of investment with patronage, due to the time lag involved [12]. As the revolvment period lengthens, the equity held by individual members may become less and less proportional to patronage if the latter varies over time. Large deviations from proportionality of investments with patronage increases the need for paying dividends on investment [12, p. 8]. Inactive members, as the most obvious deviation from proportionate equity financing by members, often have large investments in their cooperative associations but they receive no patronage refunds by virtue of their inactive status. Therefore, payment of dividends for the use of their equity capital would give inactive members a return on their equity until the equity can be revolved [23].

Those who oppose the payment of dividends point out that the payment of dividends reduces patronage refunds resulting in even longer revolvment periods [27; 28, p. 319]. Dividends also create more fixed yearly payments for the association. Simmons states that his association prefers to use the money that would be paid out in

dividends to revolve equities [29]. Furthermore, the Bureau of Internal Revenue does not classify dividends paid by non-exempt cooperatives as tax deductible expenses and are therefore taxed as corporate income [4, p. 49].

Finally, some cooperative leaders question the equity of revolving risk capital according to the age of the certificates. They argue that member capital retirements should be based upon some measure of need as in the case of deceased and retired members [15].

A.3 Permanent Capital Financing

"Concrete and steel does not revolve," [33, p. 353]. This statement typifies the feelings of proponents of financing fixed assets with permanent capital. The large investments required to build storage facilities or processing plants frequently require more capital than members alone can provide. Many cooperatives "raise what (they) can from members in the form that will get the most money and then borrow the limit on the largest possible repayment program" [2, p. 337].

Permanent equity financing is similar to common stocks issued by profit type corporations. Member-patrons purchase shares to finance the association in return for anticipated cooperative savings, realizing that such shares are unlikely to be redeemed by the cooperative [4, p. 42]. Lenders treat cooperatives so financed like profit type corporations which makes their debt capacity high and the terms of debt excellent [2]. As compared to revolving finance, there are no yearly revolvment commitments, therefore the firm's ability to service debt during poor years is much greater. Members know their investments are frozen which reduces member discontent, at least in the short run.

And it reduces membership pressure on managers and directors to revolve equities. Paying large cash dividends instead of revolving stock pleases active members and attracts new ones. This plan also curbs overexpansion since any expansion requires either additional direct permanent investments from the members or a departure from the payment of large cash dividends to the retaining of earnings [2].

A.3.1 Disadvantages of Permanent Equity Capital. Permanent equity financing is plagued by the same problems which gave rise to revolving funds. Investment is proportional only if, "all the members (do) the same percentage of the total volume each year and their permanent investment was approximately on the same basis" [2, p. 340]. But normal turnover in the association's membership means proportionality must be short-lived. Revolving finance schemes eventually rotate inactive members' interests back to them. With permanent financing, equity retirement funds must also come from patronage retains, net earnings, or direct member investments as in the case of revolving funds. But to do so may reduce the cash distribution of cooperative earnings to current patrons.

Beginning a new association or expanding an existing one presents special problems. Earlier cooperatives had much lower initial capital requirements than cooperatives today [20, p. 223]. But now members must be willing and able to make large capital contributions. Farmers tend to be borrowers rather than investors and it is often difficult for them to invest large amounts directly into their cooperative.

Earlier associations also discovered that inactive members with large holdings of permanent equity quickly forgot about the cooperative objectives once patronage refunds had ceased. They began to exert

pressure and vote for cooperative policies benefiting them as investors rather than benefiting patrons [29]. Permanent equity financing makes maintaining control by active patrons difficult unless a method of equity retirement is used.

A.3.2 Periodic Recapitalization. One method which tends to perpetuate proportionality is periodic recapitalization. Every year (or some designated time period) the proportion of risk capital each individual member should contribute is recalculated based upon the member's current patronage [15]. Members who have increased their volume of business would be required to invest more and the association would redeem excess holdings of members with reduced volumes. The primary disadvantage of this procedure is that many young energetic members simply may not have the available capital. The incentive to increase patronage may be weakened on the part of individual members. An alternative is to allow members to increase their proportional ownership by withholding cash refunds until the members have met their equity requirements [25]. Recapitalization seems more adapted to firms with low capital requirements.

A.4 Other Cooperative Equity Financing Concepts.

Although to question the concept of proportionality would appear to some a breach of cooperative orthodoxy, some cooperative leaders are doing just that. Willingness to patronize is seldom proportional to ability to finance and "too rigid an adherence to this view has cut off cooperatives from available sources of capital" [8, p. 78]. The marginal value of capital is usually higher for small young farmers than for older well established members. Therefore, younger farmers

"can well afford to have other members receive a good interest rate to provide investment capital, if the younger farmers are released from providing their proportional share of the total needed capital" [26, pp. 269-270]. Cooperatives can also tap public money markets by issuing preferred shares or interest bearing certificates [32].

Some cooperatives have elected to use a combination of permanent and revolving fund financing. For example, a firm may use permanent capital to finance fixed assets and then convert to a revolving fund after the mortgages are paid [2]. Or equal portions of total capital might be raised from permanent equity, revolving equity and debt through preferred shares or bonds [26, p. 270]. The percentage coming from each source may vary between associations because of different ties to investment-patronage proportionality, terms of available debt, and total financing requirements.

Whichever combination of equity and debt financing a cooperative uses, retiring the equity holdings of inactive members may eventually become a problem and require the generation of enough capital to repay their holdings.

B. Prior Research on Equity Retirements

Although the retirement of control and ownership of inactive members has long been a problem for cooperatives, little research has been done in this area.

In 1957, Manuel found that inactive members were a major problem for mature Kansas cooperatives, especially those that had no retirement policies. He concluded that such an association was in "danger of evolving into a business owned and controlled by a group that does not

use its services" [22, p. 13]. To prevent loss of control he suggested retiring the voting rights of an inactive member as soon as possible and establishing a priority system for retiring the financial interests of inactive members. He suggested that the equities of deceased members be repaid immediately upon their death. Also, the cooperative should redeem the voting shares of members moving out of the cooperative's service area, and at the directors' option, cash in remaining equities held by such members.

Brisco, Enix and Anderson proposed in 1968 [3] that Oklahoma cooperatives were having similar problems and that failure to retire such equities leads to a violation of the cooperative principles of service at cost and democratic control by member-patrons. They reasoned that failure to raise sufficient capital from active members to repay inactive members meant that the equity capital of inactive members was being used to finance patronage refunds for active members. Under such circumstances active members are receiving service at less than cost because financing the association is a part of the true cost. In addition, inactive voting members could eventually take control of the association and operate it for investment purposes, a violation of democratic control by active members. The researchers recommended that each cooperative establish a cash retirement reserve fund to be funded by allocations from annual earnings and that a priority rank for retiring member equities be established. Their suggested priority ranking is similar to that of Manuel.

In each case the researchers recognized that retirements would be very costly and successful funding would be heavily dependent upon a cooperative's annual earnings. However, this writer has found no

research which has investigated the quantitative relationship between annual earnings and various equity retirement policies. With the tools available, cooperative leaders have been unable to adequately measure the effects of different equity retirement policies on cooperative operations. This study is designed to provide such an analysis tool in the form of a cooperative equity retirement simulation model.

C. Simulation

Webster's Seventh New Collegiate Dictionary defines simulation as "to give the appearance of," and a simulator as "a laboratory device that enables the operator to reproduce under test conditions phenomena likely to occur in actual performance" [35, p. 811]. According to Hardacker, "simulation consists of building a model of reality which can be used to evaluate the consequences of different policies under varying conditions" [14, p. 164].

C.1 Characteristics of Simulation

Simulation allows researchers to emulate a real system under more varied circumstances or environmental conditions than would otherwise be possible within a short period of time; and thereby predict the possible results in real life if such circumstances actually occurred [10, p. 52-54]. Different circumstances are created by varying the quantitative values describing the interrelationships between subparts of the system and by changing the system's environment. Simulation also yields insights into the internal workings of the system which would seldom be revealed otherwise.

Unlike most other analytical procedures such as linear programming,

simulation has few standard assumptions [5, p. 73]. Primarily, it assumes that the quantitative values describing the interrelationships between component parts are known and fixed for any single circumstance. Additionally, simulation seldom uses an optimization procedure; rather the model is exposed to a selected set of circumstances and the results of each compared. Most computerized simulation models would be too costly to operate if an optimization procedure were included. But even without optimization many researchers feel the potential benefits of simulation exceed the restrictions.

C.2 Examples of Simulation

One of the best known uses of simulation is the "General Agricultural Firm Simulator" developed by Hutton and Hinman [19]. This routine simulates the operation of the firm by generating (1) purchases of resources, (2) financing arrangements, (3) deterministic and probabilistic enterprise yields, (4) variations in prices received, and (5) the payments of insurance and taxes. The output for an individual firm projects future cash flows, acquisition of debt, long term profitability and growth of net worth.

Another example of simulation is a bank simulation game recently developed by Fisher [9]. This game involves three or more participants or groups of participants competing among themselves as bankers in a rural community. The purpose of the simulation is to improve decision making ability in the areas of setting interest rates on savings accounts and loans, and regulating loan volume and operations within the restrictions of the Federal Reserve requirements.

An example of simulation which deals directly with agricultural cooperatives is Hummer's "Simulation Model for Evaluating Proposed

Mergers of Farmer Artificial Breeding Cooperatives." This model was developed to predict the effect of merging artificial breeding associations on costs of service, member control, managerial problems, and employee relations [17, p. 28].

No models designed to simulate the retirement of member equities in agricultural cooperatives over time were discovered in the review of literature. Such a simulation model developed in this study is described in the following chapter.

CHAPTER III

THE MODEL

This chapter presents a general overview of the equity retirement simulation model's capabilities and restraints, followed by a more specific discussion of the model's flow chart and its more important subsections.

A. AGCORPS: Its Capabilities and Restraints

The Agricultural Cooperatives' Ownership Retirement Planning System (AGCORPS) is a computerized simulation model written in the Fortran IV Computer Language and adapted to the IBM Model 360/65. Its primary purpose is to assist cooperative management in retiring member equities by simulating the effects of alternative equity retirement plans. From historical records of stock issues, financial statements and management's future expectations the computer simulates the cooperative's equity retirement progress under a specific equity retirement plan over a selected period of years. The model contains a set of seven alternative retirement plans. As a group these plans can be used to closely resemble almost any plan a cooperative might use in real life.

The model can handle cooperatives with up to two thousand members and will simulate the results of a single retirement plan for time

periods¹ of up to ten years. Deterministic runs are made either by holding the manager's assumed values for annual net margins, capital requirements, new member recruitments and member inactivity rates fixed, or by trending these values over time. When managers wish to study the effects of potential annual variations in these values the computer model generates them stochastically from prescribed data distributions, and outputs the results summarized annually over a maximum of fifteen consecutive replications of the prediction period.

The model is restricted in that the total number of original members and new members acquired over the prediction period may not exceed two thousand. Also, the present model will handle only twenty-seven years of stock issues for each member. Assumptions concerning net margins, capital requirements, credit availability, new members and the retirement plan in use may not be changed within a single computer run but can be varied on successive runs. The model also restricts the cooperative to three individual sources of credit although each may have different interest rates and loan limits.

B. The Flow Chart

The flow chart in Figure 1 depicts the movement of information within the computer model. All required input is externally coded into the format used by the model and read in block II. These inputs are derived from information from financial balance sheets and records of stock issues as well as the manager's best estimates of future earnings,

¹The "time period" will be used to refer to the number of years into the future a cooperative's management wishes to simulate.

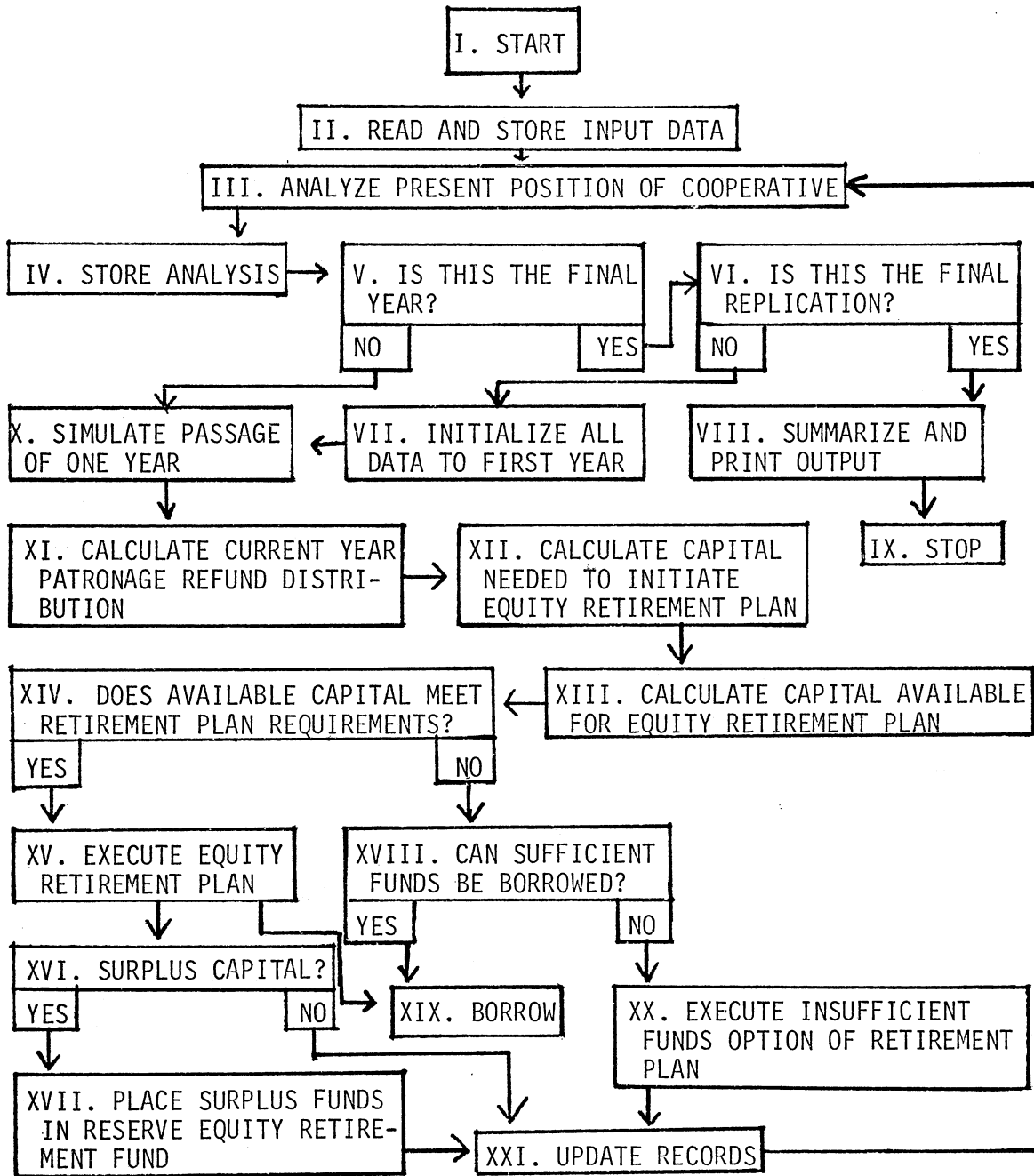


Figure 1. Flow Chart of the Cooperative Equity Retirement Simulation Model.

entries of new members, losses of old members, sources of and terms of debt capital, and the retirement plan selected for this run (along with insufficient funds or default options).

An analysis of the cooperative's beginning status determines the amount of stock held by older members and the degree to which members are inactive, and provides a basis for measuring progress (block III). Since this is the first year of the time period (block V) the model simulates the passage of one year (block X) by generating values for such variables as net margins, new members, loss of older members, and loan payments. Allocation of net margins to members takes place in block XI. The model then reviews its records of stock issues and member information to determine the capital required to fulfill the requirements of the equity retirement plan (block XII). If the funds available (block XIII) equal or exceed the amount required (block XIV) the retirement of equities is completed (block XV). If the available funds are insufficient, an attempt is made to borrow the shortage (blocks XVIII and XIX). When credit is available for such purposes, funds are borrowed to fulfill this year's required retirements under the retirement plan (block XV). When credit is not available, the default options (block XX) prescribe the actions taken.

When the capital generated within the firm exceeds that required by the retirement plan (block XVI) the excess is saved for future use (block XVII). Finally, all records are updated for changes due to stocks issued, equities retired, debts incurred, and changes in member status (block XXI).

This completes the simulation for one year and the computer returns to block III to analyze the new position of the cooperative. After the

computer has simulated the final year of the time period (block V) it checks if this is the final repetition. If the computer has simulated less than the number of repetitions requested by the user (block VI), the model initializes variable values to the original data and proceeds through another repetition. When the requested number of repetitions have been simulated the predicted results for each year are summarized across repetitions and printed (block VIII). This finishes the computer run² and completes the simulation for the set of assumptions and the equity retirement plan being considered (block IX).

C. Input Data and Simulation of Cooperative Operations

The input data controlling the simulation of cooperative operations are based upon the cooperative's financial reports and management's expectations. From this information, coefficients are developed for a group of linear equations in the model with the general format:

$$Y = A + BW + CX + ZA \quad (1)$$

where Y is a predicted annual value; A is the intercept or mean annual value; W is an independent time variable and X is a selected independent variable; B and C are linear coefficients describing the respective relationships between Y and W, and Y and X; S is the standard deviation about the relationship between Y and the two variables W and X; and Z is a normally distributed internally generated random number.

²A "computer run" or "run" will be defined as operation of the computer model beginning at "Start" in block I of Figure 1, proceeding through the prediction period for the specified number of repetitions, and terminating with the printing of results.

An illustration of the use of equation (1) follows. When the generalized equation is used to generate a single predicted average net margin for all years under deterministic conditions, A would be assigned the average annual net margin as expected by the manager. All other equation values would be zero. Therefore the predicted value Y would be the simulated annual value for net margins. A trend of margins over time could be obtained by using W as the time variable and using a non-zero trend value for B. X could be used to represent sales volume. If stochastically generated net margins are desired, a non-zero value for the standard deviation variable, S, would cause the computer to generate a value for Z from a standard normal distribution between -2 and +2. This results in a stochastically predicted value for net margins within a 95 percent confidence interval.

Equations of similar formats to equation (1) calculate annual values for sales volumes, new member entry rates, member retirements or losses, operating and investment capital requirements, interest rates on debts, etc., throughout the simulated time period.

C.1 Cooperative Operations - Net Margin

Annual net margins are the primary source of funds for equity retirement and thus are an important part of the simulation model. However, to simulate the operations behind each segment of a cooperative's income statement to obtain the net margin is beyond the scope of this study. Instead, the net margin between income and costs is obtained directly within the model with very little reference to specific costs and incomes, except for two exceptions. Debts incurred to fund retirements increase costs and thereby reduce estimated margins and taxable income.

Dividends paid on preferred stocks (which may be issued in lieu of cash in retiring member equities) may be taxed as corporate income [4, p. 43] and affect the net margin available for equity retirement. Therefore, annual net margins which are generated in the model are also internally adjusted for income taxes and the interest and dividend "expenses" just mentioned.

The computer continually updates its schedule of principal interest and preferred stock dividend payments by those "currently" incurred. Then taxes, interest charges and preferred stock dividends are deducted from annual net margins to determine the net savings. Of this sum a percentage, usually 20 percent, is paid in cash patronage refunds [31]. The remainder is distributed to cash reserves and member allocations (stock credits). The net savings less cash refunds is also the portion of net margins available for debt repayment and equity retirements.

C.2 Distribution of Patronage Refunds

Distributions of patronage refunds within the model are based upon prior distributions to individual members. The computer program calculates the proportion of the stocks issued to each individual member in exogenously selected years. The average of these values for each year provides the average percentage of total patronage per year for each individual member and is used by the model in allocating future patronage refunds. Each year, each member's percentage of patronage is adjusted for the death or loss of active members and the entry of new members so that the sum of member patronage equals 100 percent.

D. Input Data on Cooperative Members

D.1 Input Data on Present Membership

Each equity retirement plan requires a record of each member's stock credit credits, common stock credits, common stock debits, stock credit debits and the year in which each occurred. When known, each member's age and activity status should also be provided, especially if the directors wish to consider a retirement plan utilizing such information. Deceased members are assigned a coded age of 999, while living members' records carry their actual ages. The member activity status classifications are as follows: active member-patrons, retired, moved from the cooperative's service area, presently patronizes a competitor, deceased, and inactive with status and age unknown.

D.2 Changes in Member Status

The computer model simulates the normal losses of patrons or changes in member status. The probabilities of death, which are a function of age as shown in Table VIII, Appendix A, were obtained from the U.S. Department of Health, Education and Welfare's life tables [34]. These values are internal to the program. The probabilities that a member will retire because of age, begin patronizing a competitor, or move from the service area are provided externally from estimates by the cooperative management.

D.3 Data for Simulating New Member Equities

New members are those who have never patronized the cooperative. In real life a cooperative depends upon new members to provide the bulk

of its long run future business. New members are also a source of capital investments both from direct investments and retained earnings. As such, new members have a great effect on the cooperative's ability to generate capital for the retirement of equities.

The data to simulate the entry rate of new members, the volume of business they will provide, their ages, and trends in these values are externally applied to the model by the user. From these data, the model generates individual new members with characteristics and data sets similar to the original members.

E. The Equity Retirement Plans

A set of seven equity retirement plans built into AGCORPS provides a variety of approaches to retiring member equities.

E.1 Equity Retirements Based on Age of Members or Deceased Members

E.1.1 Equity Retirements Based Upon Member Ages; Equity Retirement Plan One. Plan one calls for annually retiring a fixed percentage of the shares held by each member, except for a given number of shares, when that member is over a specified age [31]. For example a cooperative's directors may wish to retire 100 percent of the stock held by each member 65 or over except for one voting share. Thus plan one is capable of simulating the return of all the member's investment in the cooperative to him except for one voting share, allowing him to remain an active part of the cooperative.

Plan one is highly flexible allowing the manager to select: (1) any minimum member age from zero to 100; (2) from zero to 100 percent

of each qualifying member's stock for annual retirements; and (3) essentially any amount of voting stock as a minimum balance per member beyond which no additional equity would be retired for that member.

If the manager in the previous example decided to start stock retirements at age 65, but felt that retiring 100 percent of their shares would create a severe drain on the cooperative's reserves, he could specify a lower percentage to be retired each year. Retirements and associated capital requirements would be spread over a longer time period.

An additional variation is to reduce or increase the limitation preventing the retirement of a voting share. If the limit were decreased to zero, eventually all of each qualifying member's shares would be retired.³

E.1.2 Dual Priority Equity Retirements Based Upon Member Ages; Equity Retirement Plan Two. Plan two is identical to one and is designed to allow their combined use when a two dimension system is desired. For example, plan one might specify annually retiring 100 percent of all equities held by members age 70 or over; and plan two might specify annually retiring 25 percent of the equities, except for one voting share, held by members age 60 or over but less than age 70. Under this two priority system the cooperative would start retiring a portion of each member's equities when he reaches age 60, gradually retire his equity except for voting rights, and complete the equity retirement process when he reaches age 70.

³If a qualifying member's equity is \$5 or less, all of that member's equity will be retired that year unless a voting share of that amount is to be retained.

Any combination of ages, stock percentages and minimum values of stocks exempted from retirements can be handled by the two plans. The only restrictions are that the smallest values for minimum age and percentage of stock retired, and the highest value of voting stocks exempted from retirement be assigned to plan two.

Regardless of the minimum ages specified in plans one or two, deceased members are included in retirements because they are assigned a coded age of 999.

E.1.3 Equity Retirements of Deceased Members; Equity Retirement Plan Three. Retirement plan three is designed to retire equities held by deceased members only [22]. Under this plan a given percentage of the equities held by each deceased member are retired annually. This plan may be especially useful for those cooperatives with a high proportion of their equity held by estates. The user of the model may elect to retire from zero to 100 percent of the deceased members' equities in any one year.

E.2 Equity Retirements of Inactive Members

Occasionally cooperatives may wish to concentrate their retirement activities on members who are inactive because they now patronize a competitor, are retired, or have moved from the cooperative's service area [22].

E.2.1 Equity Retirements of Members Patronizing Competitors; Equity Retirement Plan Four. When cooperatives wish to retire those members who have taken their business to a competitor, plan four is used. This plan allows the annual retirement of from zero to 100 percent of the stocks held by these inactive members.

E.2.2 Equity Retirements of Other Inactive Members; Equity Retirement Plan Five. Unlike the member inactivity covered by plan four, inactivity due to retiring from farming, or moving from the cooperative's service area [22, 3] may be involuntary. Therefore, equity retirements for these inactive members are grouped together. Plan five allows the annual retirement of from zero to 100 percent of their equities. An example of plan five's use would be the annual retirement of 50 percent of the shares held by retired and relocated members.

E.3 Disadvantages of Equity Retirement Plans One Through Eight

The common disadvantage of the first five retirement plans is that they may require more information than a manager may be able to obtain. If a manager determines that he could never get the ages of enough stockholders to use plans one or two, then he may be forced to use another plan.

A similar informational problem exists for plans three to five. A large proportion of the membership may have stopped patronizing the cooperative and the management may not know or have the time to determine the status of each. In either case retirements based upon the age of stocks may be a satisfactory alternative.

E.4 Equity Retirements Based Upon the Ages of Stocks

Whenever information required for equity retirement plans one through five is not available or if management wishes to base retirements on the age of stocks (as in the case of revolving funds), retire-

ment plans six and seven can be used [29; 28, pp. 339-341]. Since the ages of members advance at the same rate as stock ages, retirements based upon the age of stocks will eventually result in retiring equities held by older members and estates.

E.4.1 Equity Retirements of Oldest Equities; Equity Retirement Plan

Six. Plan six requires the annual retirement of a fixed percentage of all stocks outstanding for more than a specific number of years. For example a cooperative might wish to annually retire 100 percent of all shares issued over 29 years ago [28, pp. 338-341]. If the plan is implemented beginning in 1974, all shares issued before and including 1944 would be retired (provided funds are available). In 1975 all shares issued in 1945 would be retired, etc. The example just cited is essentially a revolving fund with a fixed time period. If management feels such a plan would be too restrictive or create an excessive drain on the cooperative's reserves, the percentage of stocks to be retired could be lowered to X percent. Then in 1974, X percent of all shares issued before and including 1944 would be retired. In 1975, the stocks issued in 1945 would be added to those still outstanding and issued before 1944. X percent of that total would be retired in 1975.

E.4.2 Dual Priority Equity Retirements of Oldest Equities; Equity Retirement Plan Seven. Plan seven is designed to be used in combination with plan six for a two priority equity retirement plan, each with identical formats. For example, plan six might require the retirement of 100 percent of all shares issued over 29 years ago and plan seven would require the retirement of 25 percent of all shares issued over 19 years ago. Therefore in 1974 all of the shares issued before 1945 would be retired and 25 percent of the shares issued after 1944 and before

1955 would be retired. This way those who have not held their stocks for a full thirty years can start getting a small portion of their investments back after 20 years and the remainder after 30 years.

When plans six and seven are used in combination, the ages of stocks included for retirements are variable, and the percentages annually retired in each category may range from zero to 100. The only restrictions are that retirement plan six must involve the oldest equities and carry the highest retirement percentage of the two plans.

E.5 Combinations Among and Variations Within Equity Retirement Plans

Although plans one and two, and six and seven may be used in combination as previously discussed, no other combinations of retirement plans are possible. Rather, each plan must be run separately. The variable values within each retirement plan can be changed for successive computer runs but not within a run. Although such changes in variable values create different retirement plans or strategies from the viewpoint of cooperative managers, they are defined as different strategies under the same retirement plan in this study.

F. Funding the Retirement of Equities

AGCORPS uses annual net margins as the primary source of funding for equity retirements. However funds can also be derived from annual depreciation, cash reserves, capital contributions by new members and cash received from regional cooperatives when they operate their own equity retirement programs [24]. The cash available for retirements is equal to the total of the items above less annual increases in working

capital requirements, investments in plants and equipment, principal payments on debts, and payment of preferred stock dividends.

F.1 Insufficient Funds Options

Each year the computer compares the cash funds available for equity retirements with those needed under the retirement plan in use (block XIV of Figure 1). Whenever funding is insufficient, one or more of three actions will take place and in the following order.

First, when allowed by cooperative management (exogenous input), preferred stocks or interest bearing certificates will be exchanged for retired membership capital. Secondly, when allowed by management, the computer will attempt to borrow retirement funds from one of the following three sources: Bank for Cooperatives, commercial lenders, and individuals. The model will attempt to borrow first from the source with the lowest interest rate. If the source with the lowest rate will not lend enough to the cooperative to fulfill its equity retirement intentions, none will be borrowed from that source, and the source with the second lowest rate will be approached for credit. This process continues until the cooperative is able to borrow the needed funds or borrows as much as possible. Whenever a loan is granted by a credit source, only that source may be approached for credit. This process continues until the cooperative is able to borrow the needed funds or borrows as much as possible. Whenever a loan is granted by a credit source, only that source may be approached for subsequent credit needs until that source has been fully repaid.

Finally, if none of these sources of funding are allowed by management or are limited to less than the retirement capital needed, one of

two default options will be used according to external input. Either the available funds will be used to retire equities on a prorated basis among the eligible recipients, or all internally generated funds will be retained for retirements next year and no equities will be retired the current year.

F.2 Disposal of Excess Retirement Funds

Whenever the total funds available for retirement exceed those required by the retirement plan for any year, the excess will be retained for future retirements.

G. Borrowing Activities and Credit Terms

AGCORPS has three internal credit sources for equity retirements and one internal credit source for long term operating debts. Each source may have different repayment terms, credit limits and interest rates.

G.1 Borrowing for Equity Retirements

Interest rates for equity retirement loans from any of the three sources may be constant over the prediction period, trended over time, or variable about the constant or trend. When the capital needed for equity retirements exceeds that generated from cooperative operations, AGCORPS will if necessary, borrow to the cooperative's credit limit from each source.

G.2 Repayment Schedules, Terms of Debt, and Credit Limits

Although interest rates may change for each year through the prediction period, the length of the repayment period and credit limitations by each credit source are not variable within a single computer run. However, managers may supply different credit limits and repayment periods for separate computer runs.

Calculations of principal and interest payment schedules assume equal annual principal payments and a fixed number of annual payments on loans from each credit source for each computer run. Principal and interest payments are made annually.

The credit available for equity retirements is limited by a maximum debt-equity ratio⁴ for each credit source as supplied by the manager.

H. The Output from AGCORPS

AGCORPS's output provides the cooperative manager with information on the cooperative's progress in retiring equities along with changes in the cooperatives financial position, given an equity retirement plan. (See Appendix C for an example of output.)

H.1 Membership Information

The number of stockholders, average age of those stockholders, number of active members and the coefficient of equity-age are printed

⁴The "debt-equity ratio" is the ratio of total liabilities to total member equity. Total liabilities is the sum of all long-term operating liabilities, current operating liabilities, long-term equity retirement loan liabilities and outstanding preferred shares.

annually to give an overview of changes in the membership over time. The coefficient of equity-age (as discussed in Chapter I) is the average age of stockholders weighted by the equity held by each. The value of equities outstanding, as broken down by age groups and deceased members, is printed annually to give a detailed picture of equity distribution. The annual distribution of non-cash patronage refunds as broken down by age groups is printed and illustrates the proportion of the cooperative's patronage attributable to members in each age group. Annual payments to members for equity retirements are also printed. They show the sources of and disposition of equity retirement funds.

H.2 Financial Information

Net margins, taxes paid, selected financial ratios, net worth, and debts incurred are principal financial variables printed annually to demonstrate changes in the cooperative's financial position.

H.3 Output from a Replicated Run

When the model is run for only one replication over the time period, a single value is calculated for each printed variable. But on replicated runs of the model the mean value of each variable is printed along with its standard deviation. To illustrate, if the model were run for one replication of the prediction period the value for net margin in the first year might be \$50,000. This figure would be printed as the predicted net margin in the first year. However, if the model were run stochastically for three replications to allow for expected variations in annual net margins, its predictions for the first year might be: 1st replication, \$50,000; 2nd replication, \$45,000; 3rd replication,

\$60,000. In this case AGCORPS would print an average of those values for its predicted value, or \$51,667 as its predicted value of net margins the first year of the prediction period. The standard deviation of the individual values is also printed.

The next chapter gives a more detailed discussion of the output from AGCORPS and discusses the sample runs of the model used to illustrate the program's capabilities and possible uses as a management tool.

CHAPTER IV

SIMULATION OF MEMBER EQUITY RETIREMENTS IN A REPRESENTATIVE AGRICULTURAL COOPERATIVE

This chapter discusses five computer simulation runs which were made using data from a representative Oklahoma agricultural supply and grain marketing cooperative. These runs illustrate AGCORPS's usefulness as a tool for managing the retirement of cooperative equities.

Run number one provides the basic situation and the four other runs will be described as variations from the basic situation. The runs were made to illustrate the effects of variations in retirement plans, annual net margins and multiple replications of the prediction period. The additional runs also allow a discussion as to how a cooperative might interpret the results of the model. Costs dictated that the number of runs be kept to a minimum.

Changes in the cooperative's progress in reducing (1) the average age of cooperative members, (2) the coefficient of equity-age, and (3) the stocks held by estates and older members are discussed in the results section of this chapter.

A. The Representative Cooperative

The representative cooperative (hereafter referred to as the "cooperative") was assumed to be a large agricultural grain marketing and farm supply cooperative whose main source of income was from the

patronage provided by its members. The cooperative's number of members approached AGCORPS's maximum number of 2,000, many of which were inactive, approaching retirement, or deceased. The actual number of members which fell into the various activity status categories are discussed with the results of the runs.

Additional characteristics and assumptions as to management practices were the result of conversations with Oklahoma State University Cooperative Extension personnel and faculty members of the Department of Agricultural Economics. These assumptions were used in determining some of the input values for the computer runs.

B. Sources of Input Data

The exogenous inputs used to simulate the operations of and provide a membership list for the representative cooperative were developed from primary data gathered by Hummer and Hampton in their survey of Oklahoma cooperatives [18]. One of the surveyed cooperatives was selected to provide membership data and a basis for developing balance sheet and other information for the computer runs.

A mailed survey of selected Oklahoma cooperatives was made to develop inputs for annual net margins, annual stock refunds, new member entry rates, the patronage they are likely to provide, and the probabilities of a member retiring from farming, moving from the cooperative's service area, or shifting patronage to a competitor (see Appendix D).

A complete list of the inputs used is shown in Appendices A and B. Only the data for one "representative" member are shown.

C. Run Number One and the Basic Situation

The following assumptions concerning the representative cooperative apply to all computer runs: (1) the retained earnings from net margins and the cooperative's financial reserves were available to meet the capital requirements of the retirement plan and to repay the existing liabilities of the cooperative, (2) outstanding debts and repayment schedules were uniform, (3) investments and the accompanying debts were restricted to replacements of small capital items, (4) the regional cooperative, in which the cooperative owned shares, annually retired part of the local cooperative's stock to assist the local in retiring equity of members over 65 or who were deceased, (5) terms of loans for equity retirement did not vary between runs, (6) initial memberships and member equity data were identical, (7) years in which non-cash patronage refunds were used to calculate the percentage of total patronage attributable to each member were constant, and (8) the average number of new members and the distribution of patronage expected from new members did not vary between runs.

The actual exogenous input values used are discussed in the following subsections and are displayed in Tables IX, X and XI of Appendix B. Most of the zero valued inputs are not discussed.

C.1 Internal Sources of Funds for Equity and Debt Retirement

The annual margins before taxes and interest on equity retirement loans were assumed to be \$90,000 per year over the ten year prediction period. Initial cash reserves for equity retirements and debt repayments were \$18,436. Annual depreciation allowances were assumed to be

4 percent of total depreciable assets which were \$800,000 initially with accumulated depreciation of \$300,000. This percentage was representative of the depreciation schedule of surveyed cooperatives similar to the "representative" cooperative simulated.

The regional cooperative (in which the local was assumed to own \$60,000 of stock) was also assumed to be assisting the local in retiring its members' stocks. The regional was assumed to be retiring the same proportion of the local cooperative's equity in the regional, as the proportion in the local cooperative of annual retired equities held by members age 65 or over (including deceased members) to the total equity outstanding in the local cooperative. The process made cash available to the local to assist in the following year's retirements. Also, the local cooperative's patronage refunds in the form of stock credits from the regional were assumed to be \$3,283 per year plus \$.0023 per dollar of the local's sales volume. This retirement plan and the patronage refund relationships were similar to that of cooperatives operating in the Oklahoma area.

C.2 Liabilities Related to Cooperative Operations

C.2.1 Long-Term and Current Liabilities. Beginning long-term liabilities were \$60,000 with three annual principal payments of \$20,000. Current liabilities were increased by \$1,377 from the \$121,377 (\$120,000 plus \$1,377 annual trend) in the base year of first simulated year. One year loans on operating losses were charged interest at a 12 percent rate.

Long-term capital investments were \$8,000 in alternate years to replace working assets. Of these investments, \$5,000 were financed by

debt repaid over a period of three years. The remainder came from internal sources.

C.2.2 Preferred Stocks and Dividends Payable. No preferred shares were assumed to be outstanding nor was their issuance allowed in any of the runs to generate capital for equity retirements; therefore preferred stock dividends were zero in all runs.

C.3 The Distribution of Net Margins

C.3.1 Deductions from Margins. Taxes on annual margins were assumed to be paid at a rate of four percent. This was the average percentage of net margins paid in taxes by the surveyed cooperatives from which the data were gathered.

A deduction of 10 percent was made from net margins (when they were positive) as an addition to statutory reserves, as required by state law.¹ These deductions were made as long as the balance in the reserve was less than the cooperative's total stock and stock credit capital. Deductions for secondary cash reserves were set at a zero percentage of net margins.

C.3.2 Distributions of Patronage Refunds. Patronage refunds were split into cash refunds and stock credits. Twenty percent of patronage refunds was assumed to be issued to members in cash with the remainder allocated as stock credits.

Percentages of patronage for each member in the model were based upon issues to members in the years 1968, 1969, 1970 and 1971. The

¹Most Oklahoma agricultural cooperatives are required by state law to set aside 10 percent of annual net earnings in a reserve fund unless such a fund equals at least 100 percent of the paid up membership fees or capital stock.

value of a common share was set at \$100. Patronage refunds for the cooperative as a whole were issued only in years when refundable savings exceeded \$500.

C.4 The Cooperative Membership

C.4.1 The Original Members and Respective Data Sets. Data were for 1570 members of the representative cooperative. The data for a "representative" member are shown in Table X of Appendix B. The data on each member included his name, a member number, the member's age in 1971, his activity status code, and a record of stock credit credits, common stock credits, common stock debits, stock credit debits and the year each occurred.

The member patronage activity status codes were provided but not utilized in run one since the retirement plan used keyed on member ages only.

C.4.2 New Members and Respective Data Sets. The annual number of new members was set at 30 members per year and the age of each new member at 24. The possible percentages of patronage are shown in Table IX (item 27, Appendix B), along with the probabilities of each being assigned to a new member. These percentages were derived from information obtained from cooperative managers.

C.4.3 Member Losses and Deaths. The probabilities of a member retiring, according to his age (Table IX, Appendix B) were estimated from experiences of cooperative managers and externally supplied to the model.

Inputs controlling member deaths are internal to the model and are shown in Table VIII, Appendix A. The probability of a member

dying in any single year is based upon that member's age.

C.5 Equity Retirements

C.5.1 The Equity Retirement Plan. The equity retirement plan in run one was constructed assuming that the cooperative was adopting a policy of annually retiring 100 percent of the equities held by members age 65 or over. The total value of the equities of these qualifying members was the amount needed to fulfill the annual requirements of the equity retirement plan.

C.5.2 Debts Incurred to Fund Equity Retirements. The insufficient funds option of borrowing funds for equity retirements when internal sources were insufficient was activated for all runs. Although the use of credit to retire equities was not an established practice for the Oklahoma cooperatives sampled by Hummer and Hampton [18] this practice was assumed, for the purpose of testing the model, just as acceptable as the acquisition of debt for expansion of the firm.

Maximum debt-equity ratios were set at zero for two of the credit sources and at "1.0" for the third source, thereby limiting the cooperative to a single credit source. Loans from that credit source were to be repaid in 10 equal annual payments and carried an annual interest rate of 10 percent.

The insufficient funds option used for run one did not allow the issuance of preferred shares to retire equities.

C.5.3 Insufficient Funds Default Options. In years when the total equity retirement funds from internal sources and debt capital (and preferred stocks for exchange, if allowed) fell short of the requirements of the equity retirement plan, an externally controlled default

option prorated available funds among eligible members. The only externally controlled restriction was that funding be sufficient to fulfill 30 percent of the equity retirements proposed by the retirement plan in use. If at least 30 percent could not be fulfilled, no equity retirements took place and the funds were saved for next year's retirements. If no equity retirements were made in a particular year no borrowings (or preferred stock exchanges) were made for equity retirements in that year.

D. Runs Two Through Five, Variations from the Basic Situation

As discussed previously in this chapter, computer runs two through five used essentially the same input values as run number one. Those values which were changed are shown in Table XI, Appendix B. These variations from the basic situation were made to illustrate how cooperative leaders might utilize various capabilities of the model and interpret the results.

D.1 Computer Runs Two and Three

Runs two and three were made to illustrate the effects of using retirement plans which varied from the plan assumed in run one. Run two was made assuming that the cooperative was adopting a policy of retiring 100 percent of the equities outstanding to only deceased members of their estates.

It was assumed in run three that the cooperative was adopting a policy of retiring 100 percent of the equities which had been outstanding for 10 or more years. This policy is similar to a revolving fund

with a revolvment period of 10 years.

D.2 Computer Run Four

Computer run four incorporated the same retirement plan as run one, except that annual margins were increased by \$10,000 per year from a base year margin of \$40,000. The effects of a lower initial but increasing margin on the cooperative's ability to retire equities was thus illustrated.

D.3 Computer Run Five

The previous four computer runs utilized a mixture of the stochastic and deterministic aspects of AGCORPS. Percentages of patronage for new members, member deaths, member retirements and other losses of members from active patron status are stochastic every time the model is run. However, in run five several other variables' values were stochastically determined and the 10 year simulation period was replicated 15 times.

Also, standard deviations of \$500,000 for sales volumes, \$60,000 for annual margins, 10 for annual number of new members, and 3 for ages of new members were supplied to the model to make these aspects of the model stochastic in run five.

E. Analysis of the Results

The complete output for run one is shown in Appendix C. Since the complete output for any one run is very voluminous, only selected portions of runs one through five will be discussed here.

E.1 The Results of Run One

E.1.1 Equity Retirements and Sources of Funding. Equity retirements were initiated in 1972, the first simulated year, as shown in Table I. The variable values for 1971 are shown to illustrate the beginning status of the cooperative.

Equity retirement payments were highest in 1972 due to the large initial number of members over age 65. At the end of 1971, 285 members were age 65 or older and held 17.27 percent of the total outstanding cooperative equities. These were repaid in cash during 1972, which reduced the equities held by this group to 1.21 percent of the total. This percentage did not go to zero immediately since the active patrons in this group received non-cash patronage refunds in 1972. This percentage did become zero by 1976 due to the death and retirement of members over 64.

The increase in the percentage of stock held by estates from .44 percent in 1971 to a high of 8.98 percent in 1975, despite the annual retirement of these stocks, was due to deaths among cooperative members under age 65.

The percentage of equity retired each year ranged from a high in 1972 of 31 percent to a low in 1978 of 2 percent.²

²These percentage of equity retirement figures are somewhat misleading at first glance. Specifically, the equity retirements in 1972 constituted 31 percent of the total equity outstanding after retirements and after stock patronage refunds. This calculation, despite its obvious problems of interpretation, was used due to the time lag characteristics of the model in its issuance of patronage refunds. Actually only 23.7 percent of the equity outstanding in 1972 was retired in 1972. This value is calculated by dividing the quoted percentage of 31 percent by 131 percent -- the total equity outstanding before the retirements and before new stock issues are included.

TABLE I
MEMBER EQUITY RETIREMENTS AND SOURCES OF FUNDING BY YEAR, SIMULATION RUN NUMBER ONE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Equity Retired Each Year (dollars)	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929
Number of Members Age 65 or Over	285	151	117	93	81	70	54	46	45	35	28
Percentage of Equities Outstanding to Members Age 65 or Over	17.27	1.21	0.31	0.23	0.11	0.0	0.0	0.0	0.0	0.0	0.0
Percentage of Equities Outstanding to Estates	.44	4.07	4.64	4.33	8.98	2.22	1.28	3.82	3.59	3.66	1.24
Percentage of Outstanding Equities Retired	0.0	31	.6	7	6	11	5	2	6	5	5
Long-Term Debts Incurred for Equity Retirements (dollars)	0.0	61,255	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Retirements of Equity by Regional Cooperative (dollars)	0.0	0.0	23,737	3,752	4,441	3,736	7,931	3,513	1,528	4,742	4,469
Net Margins (after taxes and interest) (dollars)	0.0	86,400	80,274	80,887	81,500	82,112	82,725	83,337	83,950	84,562	85,175
Depreciation Allowance (dollars)	0.0	32,000	32,000	32,320	32,320	32,640	32,640	32,960	32,960	33,280	33,280
Balance in Equity Retirement Fund (dollars)	18,436	0.0	48,762	74,802	124,864	145,877	201,157	271,804	312,991	363,362	410,566
Net Change in Working Capital (dollars)	0.0	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Payments on Long-Term Debts (dollars)	0.0	20,000	26,125	27,792	7,792	9,458	9,458	9,458	9,458	9,458	9,458
Equity Allocated for Retirement by Retirement Plan (dollars)	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	32,681	35,533	35,929
Equity Outstanding to Members Age 65 or Over (dollars)	98,043	5,730	1,598	1,229	633	25	0.0	0.0	0.0	0.0	0.0

The total funding for equity retirements in 1972 available from the equity retirement fund, net margin, cash assistance from the regional cooperative, and depreciation allowances was inadequate to cover the equities allocated for retirement. Other demands on these funds included requirements of existing debt repayment schedules, and increases in working capital as well as patronage cash refunds and statutory reserve requirements. However the cooperative was able to fulfill its equity retirement intentions by borrowing \$61,255 from the Bank for Cooperatives.

The regional cooperative assisted the local cooperative in 1973 by retiring \$23,737 of the local's stock, based upon retirements of local members' equities in 1972. The regional retired somewhat smaller amounts in succeeding years. Had the local received this assistance in the same year as its own retirements, the debt incurred to finance equity retirements could have been reduced by one third.

In no year were equity retirement funds low enough to necessitate the use of the insufficient funds default options and cause a reduced proration of available funds among those eligible. In fact, most of the debts incurred for equity retirements during 1972 could have been repaid by the end of 1974 due to the drop in retirement requirements in 1973 and 1974. The equity retirement fund had an ending balance of \$74,802 in 1974.

E.1.2 The Effects of Equity Retirements and New Member Entry Upon Membership Composition and Equities Held. Of the 1570 members included in AGCORPS, only 1260 owned stock in 1971, as shown in Table II. This difference results from members still listed on the cooperative's books but who previously have had their equity retired.

TABLE II

MEMBERSHIP COMPOSITION AND COEFFICIENT OF EQUITY-AGE BY YEAR, SIMULATION RUN NUMBER ONE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Number of Stockholders	1,260	1,000	865	848	848	848	858	873	879	894	908
Number of Active Member-Patrons	745	645	601	567	544	527	516	514	516	524	529
Number of Members Who Became Inactive Each Year	0.0	217	93	84	63	61	53	44	36	52	35
Number of New Members	0.0	30	30	30	30	30	30	30	30	30	30
New Members as a Cumulative Percentage of Total Active Membership	0.0	5	10	16	22	28	35	41	47	52	57
Average Age of Stockholders	59.90	56.51	53.94	51.49	49.19	47.33	45.43	43.95	42.51	41.62	40.33
Coefficient of Equity-Age	56.52	51.40	51.38	51.06	50.38	50.27	50.29	50.35	50.17	49.86	49.98

The total number of stockholders decreased from a high in 1971 of 1260 to a low in 1974 of 848 due to the retirement of older members' equities, as well as deaths among members and subsequent retirement of their equities. After 1976 the number of stockholders increased to a high of 908 stockholders in 1981 due to the influx of new members. Similarly, the numbers of active members declined from 745 in 1971 to 514 in 1978 and then increased to 529 in 1981. The number of active members was lower than the number of stockholders due to non-patronizing stockholders who had not reached equity retirement age.

The 217 members which became inactive during 1972 was larger than in later years due both to the classification of previously inactive members as such and the model-instigated death and retirements from farming of older members. Member inactivity during succeeding years was wholly due to the latter two reasons.

The retirement of equities held by members over age 65 when combined with the annual entry of 30 new younger members (each with age 24) caused a sustained drop in the average age of stockholders throughout the ten simulated years. New younger members can have a dramatic effect on the average age of members, especially if their entry rate is substantial. Even with the entry rate of 30 per year in run one, by 1981 new members constituted 57 percent of the active membership. Yet all members under 35 in 1981 held less than 15 percent of the total outstanding equity (Table XIV, Appendix C). Although this percentage would likely increase as they aged, it does help to emphasize the critical need for accuracy by the users of AGCORPS in estimating new member entry rates and the patronage they will provide.

The coefficient of equity-age is probably the best single measure

of a cooperative's progress in retiring the equities of older members (see Chapter I for explanation). The coefficient fell from a high of 56.5 in 1971 to a low of 49.9 in 1980. This shows substantial progress in reducing the proportion of stocks held by older members as a group. Unfortunately, the coefficient does not measure progress in the retirement of equities held by deceased members, and is also affected by the numbers and ages of new members.

E.1.3 Changes in Financial Position. The cooperative in run one began in a strong financial position, as shown in Table III, with a 15 percent rate of return on net worth in 1972 and a .11 ratio of total liabilities to total equity in 1971. Heavy initial equity retirements in 1972 caused (1) a drop in total equity from \$567,532 in 1971 to \$479,417 in 1972 as equity retirements exceeded patronage retains, (2) a rise in total liabilities from \$60,000 in 1971 to \$101,255 in 1972 due to the credit financing of equity retirements, and (3) a subsequent rise in the debt-equity ratio to .21. However, in later years, patronage retains exceeded equity retirements and resulted in a sustained rise in total equity to a high of \$704,735 in 1981. This increase in total equity from 1973 to 1981, coupled with relatively stable net margins, resulted in a drop in the rate of return on total member equity.

The increasing balance in the equity retirement fund from a low of zero in 1972 to \$410,566 in 1981 resulted both (1) from the cooperative's channeling of all its uncommitted financial resources into equity retirements, and (2) the fact that such funding exceeded the capital requirements of the equity retirement plan in every year except 1972. An actual cooperative using the model would likely direct part

TABLE III
FINANCIAL POSITION OF THE COOPERATIVE, BY YEAR, SIMULATION RUN NUMBER ONE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Member Equity (dollars)	567,532	479,417	505,544	527,212	555,154	533,038	583,933	631,229	653,991	679,341	704,735
Total Liabilities (dollars)	60,000	101,255	80,129	52,337	49,548	40,086	37,294	27,835	25,043	15,584	12,792
Statutory Cash Reserves (dollars)	107,200	115,839	123,867	131,956	140,106	148,317	156,589	164,923	173,318	181,774	190,291
Ratio of Total Liabilities to Total Equity	.11	.21	.16	.10	.09	.07	.06	.04	.04	.02	.02
Total Non-Cash Patronage Refunds (dollars)	0.0	62,208	57,797	58,238	58,679	59,120	59,561	60,002	60,443	60,884	61,325
Equity Retirements (dollars)	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929
Rate of Return on Equity (percent)	0.0	18	16	15	15	15	14	13	13	12	12
Rate of Return on Net Worth (percent)	0.0	15	13	12	12	12	11	10	10	10	10
Net Margin (after taxes and interest) (dollars)	0.0	86,400	80,274	80,887	81,500	82,112	82,725	83,337	83,950	84,562	85,175
Fixed Asset Ratio	.78	.83	.73	.66	.58	.54	.47	.40	.35	.31	.26
Balance in Equity Retirement Fund (dollars)	18,436	0.0	48,762	74,802	124,864	145,877	201,157	271,804	312,991	363,362	410,566

of this balance into early repayments of debts and capital investments. AGCORPS is designed to allow the cooperative to plan for such possibilities.

No major capital investments were assumed in run one. As such, the depreciation of assets and failure of the cooperative to replace them over the ten predicted years resulted in a steady decline in the fixed asset ratio from a high in 1972 of .83 to a low of .26 in 1981.

E.1.4 Comments on Equity Retirement Plan Number One. The major benefit of retirement plan number one as used in run one is that if a cooperative were to faithfully adhere to it, members might see it as a combined old age retirement plan and life insurance policy. The retirement of equities upon death (if before age 65) would provide cash to members' heirs and liquidate their holdings so their estates could be quickly settled.

E.2 The Results of Computer Runs Two Through Four

E.2.1 Run Number Two. In run two all deceased members' equity was retired annually but members age 65 or over were not included (as opposed to run one). Therefore, the initial equity retirement capital requirements in 1972 were \$54,260 in run two as compared with \$150,539 for run one (Table IV). Internal sources of funds were sufficient to cover the relatively low equity retirement demands in run two, making it unnecessary to borrow for equity retirement purposes. Also the balance in the equity retirement fund was \$35,023 in 1972 as compared with a zero balance in run one.

The percentage of total equity held by estates and total equities held by deceased members' estates were higher throughout the years in

TABLE IV
SELECTED OUTPUT, BY YEAR, FROM SIMULATION RUNS ONE AND TWO

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Equity Retired (dollars)											
Run One	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929
Run Two	0.0	54,260	49,637	41,717	35,951	65,775	23,697	26,175	44,628	28,635	41,290
Balance in Equity Retirement Fund (dollars)											
Run One	18,436	0.0	48,762	74,802	124,864	145,877	201,157	271,804	312,991	363,362	410,566
Run Two	18,436	35,023	60,374	94,614	150,505	177,440	247,627	312,860	356,965	422,831	470,917
Total Equity Held by Estates (dollars)											
Run One	2,502	19,531	23,471	22,823	49,861	12,301	7,488	24,093	23,507	24,886	8,731
Run Two	2,502	49,637	41,717	35,951	65,775	23,697	26,176	44,629	28,636	41,291	26,333
Percentage of Total Equity Held by Estates											
Run One	.44	4.07	4.64	4.33	8.98	2.22	1.28	3.82	3.95	3.66	1.24
Run Two	.44	8.68	7.09	5.91	10.36	3.75	3.91	6.32	3.96	5.45	3.38
Total Equity Retired to Date											
Run One	0.0	150,539	182,213	218,781	249,518	310,754	339,420	352,125	389,806	425,339	461,269
Run Two	0.0	54,260	103,898	145,615	181,566	247,341	271,038	297,214	341,843	370,478	411,769

run two, in contrast with what might be expected initially. In both runs, equities in the estates category were annually retired and replenished by the death of cooperative members. However, in run two the stocks of members age 65 or over were not retired. Members had to die for their stocks to be eligible for retirement and thus their equity was counted in the estate category.

Since the class of member equities eligible for equity retirement in run two was constantly replenished by member deaths (and the probability of death of a member age 65 or over was relatively high), over time the same member equities retired in run one would have been retired in run two. By 1981 in run one, \$461,269 of equity had been retired as compared with \$411,769 for run two. This difference was attributable to stocks still held by members age 65 or over but not retired in run two.

An equity retirement plan of deceased members only might be beneficial to cooperatives with a severe member inactivity problem and limited capital resources with which to solve the equity retirement problem. Although such a retirement policy is open to the criticism of "you have to die to get your money," it is an alternative plan to meet the problem, particularly in the first few years of equity retirement.

E.2.2 Run Number Three. Computer run number three assumed that the cooperative was adopting a policy of annually retiring all equities which had been outstanding for ten years or more. Initial equity retirements in 1972 were \$155,871, somewhat greater than in run one, as shown in Table V. Over the ten simulated years, equity retirements ranged from the initial high in 1972 down to zero, a much greater range

TABLE V
SELECTED OUTPUT, BY YEAR, FROM SIMULATION RUNS ONE AND THREE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Equity Retired (dollars)											
Run One	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929
Run Three	0.0	155,871	100	0.0	65,050	0.0	2,375	118,525	725	100	131,400
Total Equity Retired to Date (dollars)											
Run One	0.0	150,539	182,213	218,781	249,518	310,754	339,420	352,125	389,806	425,339	461,269
Run Three	0.0	155,871	155,971	155,971	221,021	221,021	223,396	341,921	342,646	342,746	474,146
Coefficient of Equity-Age											
Run One	56.52	51.40	51.38	51.06	50.38	50.27	50.29	50.35	50.17	49.86	49.96
Run Three	56.52	53.38	52.87	52.37	51.21	50.92	50.82	49.87	49.97	49.67	48.97
Percentage of Total Equity Held by Members Age 65 or Over											
Run One	17.27	1.21	0.31	0.23	0.11	0.0	0.0	0.0	0.0	0.0	0.0
Run Three	17.27	10.41	8.08	6.80	5.40	4.39	3.20	2.41	2.09	1.99	1.17
Percentage of Total Equity Held by Estates											
Run One	0.44	4.07	4.64	4.33	8.98	2.22	1.28	3.82	3.59	3.66	1.24
Run Three	0.44	15.86	20.20	22.71	26.74	26.96	27.02	25.50	25.48	26.81	22.74

than in run one.

Annual equity retirements were highly variable because annual non-cash patronage refunds in an actual cooperative are highly variable. For example, non-cash patronage refunds made in 1965 would "come due" for retirement in 1975. According to run three's results, \$65,050 came due for retirement in 1975. The zero level of equity retirement in 1976 would imply that no stock was issued in 1966. Despite the differences between the two runs in annual equity retirements, the total equity retired by 1981 was similar, with \$461,269 for run one and \$474,146 for run three.

The coefficient of equity-age fell from a high in 1971 of 56.52 to a low of 48.97 in 1981 for run three and a low of 49.96 in 1981 for run one. Although a drop in the coefficient's value is taken as a measure of progress in retiring equities held by older members, the difference between the coefficient's 1981 values on each run was too small to call either retirement plan superior in this regard.

Retirements based on the age of stocks did result in a slightly lower equity-age coefficient and more total equities being retired in the ten year period. However, a greater percentage of stocks remained in the hands of members age 65 or over. Even more significant, 22.74 percent of the total equity was held by estates by 1981 in run three as compared to 1.24 percent for run one. This difference is due to the characteristics of the retirement policies used.

Revolving fund plans, as in the retirement plan in run three, are primarily oriented toward providing a method of generating equity capital and then returning it to members on a regular basis. However, a primary criticism of revolving funds is that they are too mechanical

to adjust for the needs of individuals and estates. The retirement of equities held by older members and estates may, in the eyes of cooperative directors, treat individual members more equitably.

Revolving funds do, however, have the advantage of utilizing information which is usually available in the cooperatives' records. That is, dates of issues on equities are regularly recorded whereas ages and deaths of members may not be known to the cooperative's management -- information which was required in run number one. Revolving funds also have the advantage of a tendency to keep investment in proportion to patronage, on an individual member basis.

E.2.3 Run Number Four. The data inputs for computer run number four were identical to those of run one except for changes necessary to trend net margins (before taxes and equity retirement financing interest charges) from a low of \$40,000 in 1972 to a high of \$130,000 for 1981, as shown in Table VI. Recall that the net margin in run one was set at \$90,000 annually. This comparison was made to investigate the ability of the cooperative to retire equities when increasing margins over time were expected. The emphasis was on a cooperative with relatively low initial margins, but with a bright future, as compared with a cooperative with consistent average margins.

Net margins after taxes and interest charges in run four ranged from a low in 1973 of \$37,939 up to \$122,788 in 1981. The low margin in 1973, despite higher before-tax-and-interest net margins, was due to interest charges on the debts incurred in 1972. The same amount of stock was retired in 1972 in both runs, however the lower net margin in run four necessitated the borrowing in 1972 of \$100,615 as compared with \$61,255 for run one.

TABLE VI
SELECTED OUTPUT, BY YEAR, FROM SIMULATION RUNS ONE AND FOUR

	Years											
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	
Net Margin (before taxes and interest charges) (dollars)												
Run One	0.0	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
Run Four	0.0	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000	130,000	130,000
Net Margin (after taxes and interest charges) (dollars)												
Run One	0.0	86,400	80,274	80,887	81,500	82,112	82,725	83,337	83,950	85,562	85,175	85,175
Run Four	0.0	38,400	37,939	48,545	59,151	69,757	80,363	90,696	101,575	112,182	122,788	122,788
Total Equity Retired (dollars)												
Run One	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929	35,929
Run Four	0.0	150,539	26,392	33,010	27,412	52,600	24,380	11,147	32,148	31,289	32,157	32,157
Percentage of Total Equity Held by Estates and Members Age 65 or Over												
Run One	17.71	5.28	4.95	4.56	9.09	2.22	1.28	3.82	3.59	3.66	1.24	1.24
Run Four	17.71	4.58	4.90	4.67	9.27	2.24	1.25	3.79	3.58	3.53	1.22	1.22
Ratio of Total Liabilities to Total Equities												
Run One	0.11	0.21	0.16	0.10	0.09	0.07	0.06	0.04	0.04	0.02	0.02	0.02
Run Four	0.11	0.32	0.26	0.19	0.17	0.14	0.12	0.08	0.06	0.04	0.02	0.02
Balance in Equity Retirement Fund (dollars)												
Run One	18,436	0.0	48,762	74,802	124,869	145,877	201,157	271,804	312,991	363,362	410,566	410,566
Run Four	18,436	0.0	17,236	16,061	47,353	63,094	116,826	191,277	248,493	321,469	398,997	398,997

As shown in Table VI, approximately the same amount of stock was retired under each plan when compared on an annual basis. The slightly lower values for equity retired in run four are attributable to the lower stock credit refunds in the early simulated years when earnings were below those of run one.

The ratio of total liabilities to total equities was higher at the end of 1972 in run four due to the aforementioned higher liabilities. Lower total equity resulting from the lowered stock credit refunds helped to maintain this relationship through 1980. However, by 1981 the ratios were equal at .02 for the two runs since (1) increasing net margins in run four surpassed those of run one by 1978, (2) the accompanying stock credit patronage refunds in run four exceeded those of run one, and (3) the ten year repayment period on liabilities for equity retirements acquired in 1972 was approaching an end in both runs by 1981.

By 1981 the increased earnings in run four had allowed the cooperative to fulfill its equity retirement intentions and have a balance of \$398,997 in the equity retirement fund as compared with \$410,566 for run one. Progress in retiring equities as measured by the percentage of total equities held by members age 65 or over and estates was similar in each run. The drop from the beginning 17.71 percent to 1.22 percent by the end of 1981 for run number four was very similar to run one. Although not shown in Table VI, progress as measured by a drop in average age of members or by the equity-age coefficient was also very similar since the same plan was used and each member was fully retired as he became eligible.

Results from run four help to illustrate how a cooperative which has low margins may be able to plan the successful operation of an equity retirement policy if (1) it can get the financing and (2) new and younger members will respond with increased patronage to generate the earnings to repay initial loans.

E.3 The Results of Computer Run Number Five

Run number five was made to illustrate AGCORPS's capability to simulate the effects of stochastic variations in annual net margins and new member entry rates.

E.3.1 Equity Retirements and Sources of Funding. Net margins were randomly selected from a normal distribution with mean of \$90,000 and a standard deviation of \$60,000. The value selected was restricted to fall within an interval of two standard deviations either side of the mean. The average of the simulated values ranged from a low in 1976 of \$58,559 to a high in 1977 of \$112,553 (Table VII). Computed standard deviations about the average annual net margins ranged from a low of \$39,260 for a mean of \$58,559 in 1976 to a high of \$72,880 for a mean of \$61,048 in 1980. The average of the net margin values across the years 1972 to 1981 was \$86,432, very close to the data input mean of \$90,000, and the \$90,000 per year for run one.

Annual values for net margins were not low enough in any of the fifteen replications to necessitate the execution of the insufficient funds default options. This is known because the individually simulated values of actual equity retirements and required equity retirements by the plan in use were equal for all years. The latter value would have been larger than the first if in any year of any replication, available

TABLE VII
SELECTED OUTPUT, BY YEAR, FROM SIMULATION RUNS ONE AND FIVE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Net Margin Before Taxes and Interest Charges (dollars)											
Run One ^a	0.0	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
Run Five ^a	0.0	73,151	94,462	97,685	93,845	58,559	112,553	83,727	89,973	61,048	99,320
	0.0	48,163	64,137	48,664	49,558	39,260	47,705	45,137	52,480	72,880	68,935
Total Equity Retired Each Year (dollars)											
Run One ^a	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929
Run Five ^a	0.0	153,230	38,090	36,619	32,853	41,557	54,497	26,055	33,341	33,832	32,172
	0.0	6,089	8,487	10,815	9,072	12,414	9,256	8,328	14,385	14,144	12,609
Total Equity Allocated for Retirement Under the Retirement Plan (dollars)											
Run One ^a	0.0	150,539	31,674	36,567	30,737	61,236	28,665	12,704	37,681	35,533	35,929
Run Five ^a	0.0	153,230	38,090	36,619	32,853	41,557	54,497	26,055	33,341	33,832	32,172
	0.0	6,089	8,487	10,815	9,072	12,414	9,256	8,328	14,385	14,144	12,609
Ratio of Total Liabilities to Total Equity											
Run One ^a	0.11	0.21	0.16	0.10	0.09	0.07	0.06	0.04	0.04	0.02	0.02
Run Five ^a	0.11	0.26	0.21	0.14	0.12	0.10	0.10	0.07	0.06	0.04	0.03
	0.0	0.10	0.09	0.07	0.06	0.05	0.06	0.05	0.04	0.03	0.02
Number of New Members											
Run One ^a	0.0	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Run Five ^a	0.0	32.38	30.27	30.87	28.07	28.80	33.33	29.27	37.13	28.53	28.53
	0.0	8.92	8.87	10.28	10.24	9.97	10.85	8.95	14.56	10.53	10.05
Average Age of Stockholders											
Run One ^a	59.90	56.51	53.94	51.49	49.19	47.33	45.43	43.95	42.51	41.62	40.33
Run Five ^a	59.90	56.30	53.41	50.89	48.90	46.95	45.04	43.65	42.08	41.04	40.14
	0.0	0.50	0.53	1.00	1.25	1.42	1.26	1.28	1.27	1.19	1.26
Coefficient of Equity-Age											
Run One ^a	56.52	51.40	51.38	51.06	50.38	50.27	50.29	50.35	50.17	49.86	49.98
Run Five ^a	56.52	51.41	51.23	50.80	50.58	50.38	49.49	49.36	49.17	49.27	48.95
	0.0	0.19	0.43	0.40	0.55	0.75	0.98	1.09	1.04	1.05	1.21

^aThe first row of data for run five contains the average of the replicated estimates and the second row contains the standard deviation of the estimates.

funds were prorated among those eligible for retirement. Although the discrepancy between the two would have been partially camouflaged by the averaging process the average values would have been somewhat different.

For example, if in replication number six for year 1972 net margins were very low and sufficient funds could be borrowed only to retire \$100,000 of the \$153,230 equities which should be retired in 1972 under the retirement plan, then the model would prorate the \$100,000 available among the eligible members. And, if the other fourteen replications of 1972, \$153,230 of equities were allocated for retirement and funds were available, then when the individual values for actual equity retired and required equity retirements were averaged across the fifteen replications the averages would be different.

The distribution of equity retirements in run five differed somewhat over the ten years from the annual values of run one as shown in Table VII. However between 1972 and 1981, inclusive, the total equities retired were similar with \$482,250 for run five and \$461,269 for run one.

The average value of the total liabilities to total equity ratio in 1972 for run five was higher at .26 than that of run one at .21. On the average, equity retirement capital requirements were higher in 1972 in run five than in run one, resulting in greater credit needs. The year 1972 was selected since initial retirements were much greater than in subsequent years. However, if a normal distribution was assumed, then the "debt-equity" ratio after retirement financing should fall below .46 approximately 97.5 percent of the time. In other words, the cooperative's management could reasonably expect to have total

liabilities, including those for operations and equity retirements, of less than 46 percent of the equity outstanding (after the retirements) 97.5 percent of the time.

This illustrates one of the model's most useful capabilities. Many cooperatives will logically ask the question "how deep into debt will we need to go to initiate our retirement program?" Although the model can not calculate the exact amount of credit to be needed, it should give sufficiently reliable predictions to allow cooperative managers to plan credit needs and to place confidence in their ability to repay those liabilities.

E.3.2 Changes in Membership Composition. The number of new member entries each year was randomly chosen from a normal distribution with a mean of 30 and standard deviation of 10. The number selected was restricted to within two standard deviations of the mean. The use of integer variables in the Fortran program prevented the model from simulating fractions of a member.

Average annual new member entry rates ranged from a low of 28.07 in 1975 to a high of 37.13 members in 1979. The entry of these new members when coupled with the retirement of older members and estates resulted in a drop in the average age of stockholders from 59.90 in 1971 to 40.14 in 1981 for run five and 40.33 for run one. The standard deviation of the average age of stockholders in the year 1981 in run five was 1.26. Therefore, assuming a normal distribution and that the inputs to the model were accurate, the cooperative's retirement plan could be expected to reduce the average age of its stockholders to at least 42.66, $(40.14 + 2[1.26])$, approximately 97.5 percent of the time by 1981.

The annual average member ages and the annual coefficient of equity age over the ten years in runs one and five were very similar.

F. Summary of the Computer Run Analyses

F.1 Equity Retirements and Sources of Funding

The value of equities retired and accompanying debt capital requirements were highest in the first simulated year (1972) of each run with the exception of run two (equity retirement of deceased members). In actual circumstances the capital requirements of any retirement plan are likely to be heaviest in the first year of operation as the backlog of eligible equities are retired.

Capital requirements to retire estates and members age 65 or over (run one) were \$150,539 in 1972 and ranged from \$12,704 to \$61,236 with a 9 year average of \$32,300 per year. The relative uniformity of capital requirements after the initial year makes this plan desirable for budgetary and financial purposes, given the assumptions of the simulated cooperative. Debt financing, when necessary, occurred only in the first year for all runs and the loans were easily repaid over the ensuing years.

The retirement of stocks outstanding 10 years or longer (run number three) required the heaviest initial capital outlay (\$155,871). However, unlike plan one, this plan resulted in highly variable annual capital requirements in succeeding years. These retirements ranged from zero to \$131,400 for any one year and illustrated the primary shortcomings of revolving plans with fixed maturity dates. Such retirement plans are characterized by wide fluctuations in annual capital requirements

due to the direct relationship between stock issues and annual margins. For example, since no stocks were due for retirement in 1974 we can hypothesize that the earnings of the coop were quite low in 1964. The \$65,050 retired in 1975 implies that earnings were substantial in 1965. The cooperative may find it difficult to budget to meet equity retirement obligations under such variable conditions, particularly in years with low net margins.

Unlike the retirement plans based on age of member and of stock, the retirement of deceased members' equity required initial funding which was met from capital internal to the cooperative. In 1972, \$54,260 of equities were retired and annual retirements ranged from \$23,697 up to \$65,775. By 1981, \$411,769 of deceased members' stock had been retired compared with \$474,146 which was the highest of the other two plans. Therefore, approximately the same amount of stock will be retired by either plan. But retiring the equity of deceased members only, required no credit and required relatively uniform capital flow over the years, given the assumptions of the simulated cooperative.

F.2 Changes in Membership Composition

Progress in decreasing the equities held by oldest members as measured by the drop in the coefficient of equity-age was greatest when retirements were based upon stock ages. However, this advantage was slight with a coefficient value of 48.97 as compared to 49.89 for retirements of deceased and older members. However, progress during the initial year was greatest under retirements of older and deceased members when the equity-age coefficient dropped from an original value

of 56.52 to 51.40. The initial year's results of the other plans were less impressive at 54.20 for retirements of deceased members only and 53.38 for retirement of older issues. This initial improvement by the retirement of deceased and older members was sustained throughout most of the 10 year period.

F.3 Changes in Financial Position

Total equity was maintained at approximately the same level for each retirement plan. Although total equity declined at first due to the heavy initial retirements of two of the plans as previously discussed, it then increased over the ten years for each retirement plan. Total equity in 1981 was highest (\$778,054) for the plan retiring deceased members only.

The debt capital required to finance the initial year of retirements was highest at \$66,587 for retirements of oldest stocks. However, it was only slightly higher than the \$61,255 loan obtained to begin retiring equity of older and deceased members. Debt-equity ratios were lowest under the plan retiring deceased members only, since no debt capital was needed.

F.4 Simulation of Multiple Time Periods

The final computer run which simulated the ten year time period fifteen times gave results which varied little from the single replication in run one. The most valuable results were those indicating that the cooperative as constructed, even if faced with highly variable annual margins, should be able to fulfill its retirement plan by acquiring debt capital. Furthermore, according to the results, 97.5

percent of the time the debt-equity ratio should be below .46 in the initial year of the program. This information would be especially valuable in acquiring debt financing of the program.

G. Costs of the Exemplary Computer Runs

The total computer costs of the first four runs were very close and ranged from a high of \$34.97 for run one to a low of \$31.40 for run three. The narrow range was primarily because the model was performing a similar number of calculations each run. Some savings could have been made by placing the main program on disk to prevent recompilation for each run. Much of the cost is associated with analyzing the voluminous member data. Fewer cooperative members would result in a significantly lower cost.

When the number of replications was increased from one, as used in runs one through four, to fifteen for computer run number five, the total cost increased to \$205.09. The fourteen additional replications cost an average of approximately \$12.00 each, over and above the single replication in run one.

CHAPTER V

SUMMARY AND CONCLUSIONS

A. Introduction

This chapter gives a brief summary of the equity-age problem in agricultural cooperatives and their general inability and inactivity in coping with the problem to date. The objectives of the study and the way in which they were accomplished are then reviewed. Finally, the capabilities, benefits, and costs of using the Agricultural Cooperatives' Ownership Retirement Planning System (AGCORPS), developed during this study, are summarized.

B. The Problem

The disposition of equities held by inactive cooperative members is a problem which plagues many cooperatives as their original members retire from farming, move from the cooperative's service area, shift their patronage to competing firms, or die. At least two primary factors of concern are involved: (1) the failure to retire the equities held by inactive members violates the service at cost and democratic control principles of cooperation; and (2) the tools available to cooperatives for predicting the effects of alternative equity retirement plans are often inadequate.

The ability to retire cooperative equities depends upon many interrelated factors: (1) annual net margins; (2) the proportion of

net margins retained within the association; (3) equities eligible for retirement annually under various retirement policies; (4) future internal capital requirements; (5) new members and their volume of patronage; and (6) the sources of debt capital and accompanying restrictions. These factors cannot be analyzed easily with the tools traditionally available to researchers and cooperative leaders.

C. Purpose of the Study

The objectives of this study were threefold: (1) to develop a set of cooperative member equity retirement plans; (2) to develop a computerized simulation model to predict the effects of alternate equity retirement plans on the cooperative; and (3) to evaluate the usefulness of the model as a tool to assist cooperative managers in assessing the effects of various equity retirement policies.

D. Procedure

A set of equity retirement plans were developed from those in use by cooperatives, described in the literature, and from ideas developed during the research program. Particular effort was made to minimize the number of basic retirement plans commensurate with extensive managerial flexibility.

AGCORPS was developed from a flow chart depicting the funding of equity retirements by an agricultural marketing and supply cooperative. The computerized model of AGCORPS was written in Fortran IV language and was adapted for use on the IBM 360/65 computer.

Five exemplary runs of AGCORPS were made using data from a "representative" agricultural cooperative to illustrate benefits and costs to

cooperative management. Data were obtained from questionnaires completed by selected cooperative managers and from a prior study by Hummer and Hampton [18].

E. The Equity Retirement Plans

The equity retirement plans built into AGCORPS allow the simulation of member equity retirement programs based upon (1) member ages, (2) the activity status of individual cooperative members, such as deceased, retired, or moved from the business area, or (3) the ages of the equities themselves.

More specifically, equity retirement plan number one requires the annual retirement of X percent of the equities held by members Y years of age or over except for Z dollars of equity. The values for variables X, Y, and Z are externally supplied. Plan two is a duplicate of plan one and is designed to be used in combination with plan one when a dual priority system is desired. For example, a cooperative might wish to retire 25 percent of the stock held by members age 60 or over, and 100 percent of the stock held by members age 70 or over.

Plan three requires the annual retirement of X percent of the equities held by estates. Plan four requires the annual retirement of X percent of equities held by members who are presently patronizing competitive businesses. Plan five provides for annually retiring X percent of the equities held by those members retired from farming or who have moved from the association's service area.

The primary disadvantage of the first five retirement plans is the information that is required on each member. Plans six and seven utilize the cooperative's records of stock issues which are usually

readily available.

Plan six annually retires X percent of the equities outstanding for Y years or longer. For example, 100 percent of the equities outstanding for 10 years or longer might be annually retired. Plan seven is a duplicate of plan six and is designed to be used in a dual priority retirement program. For example, a cooperative might wish to retire 50 percent of member stocks outstanding for 10 years or longer and 100 percent of the equities outstanding for 15 years or longer.

F. The Simulation Model

F.1 The Model's Capabilities

The model was developed to handle cooperatives with up to a total of 2,000 members. This total includes both original members and those acquired during the simulation. Yearly net margins, records of patronage refunds to members, individual member data, existing debts and the variables controlling the retirement plans are external inputs. The model is capable of simulating up to 10 years with 15 replications.

F.2 Simulation of Equity Retirements

Each simulation run begins with the reading and storage of membership data and other external control data. The initial membership composition and financial situation is evaluated before equity retirements are begun. The passage of the first year is then simulated by calculating annual net margins, repayment of debts, acquisition of additional debts, entry of new members, and losses of older members. Then annual patronage refunds are distributed to the members and the capital needed

to retire the eligible equities is calculated. If the funds generated within the cooperative are sufficient to meet the requirements of the equity retirement plan then the program proceeds to retire the qualified member equities.

If internal funding is insufficient to meet equity retirement needs, the model attempts to borrow sufficient capital to cover the shortage. If sufficient funds cannot be borrowed the model is capable of prorating the available capital among the eligible members. This completes the simulation of the first year.

The model then analyzes once more the membership composition and the cooperative's financial position. This procedure continues for up to ten years. If the model has been directed to simulate additional time periods, the data are initialized to the original values and the second replication begins. This process continues for the predetermined number of replications with the results being summarized and printed for each year.

Changes in assumptions as to net margins, credit availability, new member entry rates, and equity retirement policies are handled by the model on separate computer runs. Alternative retirement policies can be evaluated by cooperative management by comparing the output from each run made under user-selected assumptions.

F.3 The Output from AGCORPS

The output from AGCORPS is divided into three basic categories: (1) the membership composition which includes the average age of members, the coefficient of equity-age (see Chapter I for definition), the distribution of equities among member age groups, and the number of members

within age groups; (2) the cooperative financial position which includes total outstanding equity, taxes paid, interest payments, outstanding liabilities, the fixed asset ratio and the debt-equity ratio; and (3) equity retirement values which include total equity retired, sources of retirement capital, proportion of total equity retired, and the balance of the equity retirement fund. The changes in these values over the simulated time period can be used to analyze the changes in the cooperatives financial stability and progress in retiring member equities.

G. The Computer Runs

Computer runs one through three were made to compare the predicted effects of different retirement plans on the "representative" cooperative. The three plans were (1) annual retirement of all equities held by estates and members age 65 or over; (2) annual retirement of all equities held by estates, and (3) annual retirement of all stocks outstanding for 10 years or longer. The initial capital requirements were highest for the first and third retirement plans and necessitated the acquisition of debt to retire all eligible equities the first year. Capital requirements in remaining years were relatively uniform for the first plan and highly variable for the third plan. The second plan had relatively uniform capital requirements throughout. The coefficient of equity-age decreased the fastest initially under the first plan but by the tenth year the coefficient values were similar under all three plans.

Run four was made to illustrate the ability of a cooperative with low initial earnings to finance an equity retirement program, given low

but increasing initial earnings relative to run one. Although substantial initial credit was required, the cooperative was able to repay the debts with the increasing earnings over the 10 year period.

The fifth run was made to demonstrate the ability of the model to illustrate the effects of stochastic variation in net margins upon a cooperative's equity retirement capacity. The output revealed that given the representative cooperative, management would most likely not have to acquire excessive debt to proceed with equity retirements.

H. Conclusions

The Agricultural Cooperative's Ownership Retirement System was developed to provide cooperative managers with a tool to analyze and anticipate the problems resulting from member equity retirement policies are desirable because they (1) give value to the cooperative's stock, (2) give meaning to the cooperative principle of service at cost, (3) tend to keep individual capital contributions roughly proportionate to patronage, and (4) may result in increased patronage by young farmers responding to the knowledge that equities may be redeemed in their lifetime.

H.1 The Benefits of AGCORPS

Despite the advantages of retiring member stock on a regular basis, there are many uncertainties involved. Management needs to know how alternative equity retirement programs are expected to affect the operation of the business. Specifically, cooperative leaders are interested in (1) the amounts and sources of capital needed over time to meet the retirement program, (2) the change in the balance sheet or

capital structure of the cooperative, and (3) the change in the distribution of member equities by age of members and/or age of equities.

The simulation runs discussed in Chapter IV illustrate several assets of AGCORPS which make the model useful to cooperative leaders in evaluating proposed equity retirement policies. The great flexibility of AGCORPS with respect to the various types of data it can handle concerning cooperative earnings, liabilities, membership composition and change, and equity retirement operations, allows the model to be adapted to almost any unique agricultural cooperative situation. The model is also useful in its ability to simulate the equity repayment stream (cash flow) under a given treatment plan. Such a cash outflow analysis is necessary in planning to meet future obligations. Correspondingly, the cooperative manager may gain information from the model's output concerning the amount of income which the cooperative will need to generate to meet the equity retirement outflow as well as other projected outlays.

The model is capable of mapping, on a yearly basis, the stress on the financial viability of the cooperative, given alternative assumptions with respect to earnings and equity retirement policies. Debt-equity ratios, total liabilities, total equity, and rate of return on equity are projected by the model. Also useful to the manager is the model's monitoring of changes in membership composition, and the progress made in retiring equities held by estates and inactive or older members. A complete map of equity distribution by member age groups can be used by the manager for planning purposes.

Probably AGCORPS's major potential contribution to agricultural cooperative management is the complete analysis possible in comparing

successes and restraints of alternative equity retirement plans in meeting cooperative objectives. The "best" retirement plan will differ between cooperatives given each cooperative's objectives and unique member composition and equity situation. AGCORPS can effectively help cooperative management select that "best" plan.

H.2 Problems Associated with Using AGCORPS

The model's shortcomings are similar to those of most simulation models. The quality of the model's predictions are only as good as the input data. Some cooperative leaders may not have data necessary to effectively use the model. Records may have been destroyed or members may have been inactive and "lost" for extended periods making it impossible to classify them as to age, deceased, retired, etc., even though a cooperative may wish to base retirements upon those criteria.

The model's predictions may be poor or misleading if a manager over-estimates the firm's capital requirements for other programs. However, these data problems would exist for the manager regardless of whether he used AGCORPS, or a simple budgeting process, or just plain subjective estimates. The collection of data by cooperative managers for use by AGCORPS, in and of itself, will be of benefit to management in evaluating and operating equity retirement programs.

The model has another potential disadvantage. The alternative equity retirement plans built into the model may not have sufficient flexibility to include all retirement programs perceived by potential users. Undoubtedly, modifications of the model will become necessary as it is placed in use and its equity retirement inadequacies become apparent. However, it is felt that the model is sufficiently realistic

to be of practical use in planning equity retirement programs.

H.3 Costs of Using AGCORPS

The costs of using AGCORPS fall into three categories. The cost of computer time is perhaps the most obvious and quantifiable. Computer costs will vary depending on such variables as number of members, length of simulated time period, and number of replications. However, a single replication of a ten year period should cost less than \$40 per run. Fifteen replications should cost less than \$300.

The second cost is the labor involved in gathering primary member data and input values. This cost depends upon the size of the cooperative, the completeness of member records, and the types of runs the cooperative management wishes to make.

The third cost involves the preparation of the data for input into AGCORPS, as well as the operator's time. Such costs are difficult to determine without a knowledge of the primary data. However, if the model is placed into use on a commercial basis the total cost to each cooperative user will most likely be low relative to the potential benefits. Implementing a poorly planned equity retirement program involving hundreds of thousands of dollars, which financially jeopardizes the cooperative of which must be abandoned as infeasible, may cost much more in service and/or member loyalty than the cost associated with AGCORPS.

I. Suggested Improvements of the Model

As this study was being completed, the writer noted several improvements which could be made in the model. First, the model could

be modified to allow early repayments of equity retirement loans at the option of the directors when the balance in the equity retirement fund rises above a predetermined sum. In the same regard, major capital investments should also be allowed if the balance in the equity retirement fund were to rise above the predetermined sum.

The equity retirement plans could be refined to accelerate the retirement of eligible equities held by inactive members when funds are available. For example, if 50 percent of eligible equities are to be annually retired then the model should have the option available to retire one half the first year and the rest the second year, if feasible, rather than 50 percent of the outstanding balance each year. At present the model must retire the member's equity balance down to five dollars before the final balance is retired.

The simulation of new member patronage is probably the weakest part of the model. This is largely due to the difficulty of anticipating and quantifying the response of new members to cooperative policies. Further study needs to be done to more closely approximate data inputs in this area.

An additional costly modification of the model would be to simulate the actual operation of the cooperative. This modification would dramatically improve the realism of the model. However, such a modification was beyond the scope of this research project and probably would not have substantially improved the model with respect to its rather narrow purpose in this study.

BIBLIOGRAPHY

- [1] Allewelt, William F., Jr. "What Are the Long-Range Financing Alternatives for Cooperative Growth?" American Cooperation, 1970, pp. 470-477.
- [2] Breihan, Edward. "Permanent Capital to Offset Fixed Assets." American Cooperation, 1951, pp. 337-440.
- [3] Briscoe, Nellis A., James R. Enix and Per P. Anderson. "Retirement of Control and Ownership Equities of Inactive Cooperative Members." Stillwater: Oklahoma Agricultural Experiment Station, Research Bulletin B-659, July, 1968.
- [4] Davis, John H. An Economic Analysis of the Tax Status of Farmer Cooperatives. American Institute of Cooperation, 1950.
- [5] Emshoff, James R. and Roger L. Sisson. Design and Use of Computer Simulation Models. New York: Macmillian, 1970.
- [6] Engberg, Russel C. Financing Farmer Cooperatives. Banks for Cooperatives, 1965.
- [7] Erdman, Henry E. "Revolving All Your Capital." American Cooperation, 1951, pp. 341-348.
- [8] Erdman, Henry E., and Grace H. Larsen. Revolving Finance in Agricultural Cooperation. Madison: Mimir Publishers, Inc., 1965.
- [9] Fisher, Glen D. "The Development of a Management Game for Oklahoma Rural Banks." (Unpub. M.S. thesis, Oklahoma State University, 1973.)
- [10] Forrester, Jay W. Industrial Dynamics. Cambridge: M.I.T. Press, 1969.
- [11] Griffin, Nelda. "Financial Structure of Regional Farmer Cooperatives." Washington: USDA, Farmer Cooperative Service, General Report 133, April, 1966.
- [12] Griffin, Nelda, Helm H. Hulbert and Kelsey B. Gardner. "How About Interest or Dividends on Revolving Capital?" News for Farmer Cooperatives, October, 1957, p. 8.
- [13] Hamman, Charles F. "Our Experiences with Revolving Funds." American Cooperation, 1960, pp. 105-106.

- [14] Hardaker, J. B. "The Use of Simulation Techniques in Farm Management." Farm Economist, 11, pp. 162-171.
- [15] Heitz, Glen E. "In Financing Cooperative Growth." American Cooperation, 1972, pp. 15-19.
- [16] Hulbert, Helm H., Nelda Griffin and Kelsey B. Gardner. "Revolving Fund Method of Financing Farmer Cooperatives." Washington: USDA, Farmer Cooperative Service, General Report 41, March, 1958.
- [17] Hummer, Paul D. "A Simulation Model for Evaluating Proposed Mergers of Farmer Artificial Breeding Cooperatives." (Unpub. Ph.D. dissertation, The Pennsylvania State University, 1970.)
- [18] Hummer, Paul D. and Joseph Hampton. "Potential Effects of Alternative Equity Financing Plans on Agricultural Cooperatives Over Time." (Unpub. Progress Report, Oklahoma State University, August, 1973.)
- [19] Hutton, R. F. and H. R. Hinman. "A General Agricultural Firm Simulator." University Park: Pennsylvania Agricultural Experiment Station, A. E. and R. S. 72, May, 1968.
- [20] Knapp, Joseph G. The Advance of American Cooperative Enterprise: 1920-1949. Danville: Interstate Printers and Publishers, Inc., 1973.
- [21] Knapp, Joseph G. The Rise of American Cooperative Enterprise: 1620-1920. Danville: Interstate Printers and Publishers, Inc., 1969.
- [22] Manuel, Milton L. "Retiring Control and Equities of Inactive Co-op Members." Manhattan: Kansas Agricultural Experiment Station, Circular 343, 1957.
- [23] Manuel, Milton L. and French M. Hyre. "Patronage Refund Principle." Manhattan: Kansas Agricultural Experiment Station, Circular 301, 1953.
- [24] "Ownership Retirement Program." Kansas City: Farmland Industries, Inc., August 1, 1973.
- [25] Parry, Tom C. "Equitable Treatment of Members as Related to Computations and Distribution of Patronage Refunds, Problems and Practices." American Cooperation, 1965, p. 630.
- [26] Phillips, Richard. Managing for Greater Returns. 2nd Ed. Manhattan: Agri-Research Inc., 1962.
- [27] Reynolds, Quentin. "The Philosophy of Cooperation." In Agricultural Cooperation - Selected Readings. Minneapolis: The University of Minnesota Press, 1957.

- [28] Roy, Ewell Paul. Cooperatives: Today and Tomorrow. Danville: Interstate Publishers and Printers, Inc., 1964.
- [29] Simmons, Carl. "Capital Stock and Revolving Stock." American Cooperation, 1956, pp. 349-351.
- [30] Snider, T. E. and E. F. Koller. "The Cost of Capital in Minnesota Dairy Cooperatives." Minneapolis: Minnesota Agricultural Experiment Station, Bulletin 503, 1971.
- [31] Taylor, Jack R. "Cooperatives Use Both Standard and Unique Financing." American Cooperation, 1972, pp. 183-188.
- [32] Tubbs, Alan R. and Richard R. West. "The Use of Debt in the Cooperative Capital Structure." Ithaca: Cornell University Agricultural Experiment Station, Agricultural Economics Research Bulletin 336, October, 1971.
- [33] Van Hemert, Paul. "Permanent Capital Financing for Cooperatives." American Cooperation, 1956, pp. 352-355.
- [34] Vital Statistics of the United States. Washington: H.E.W., National Center for Health Services, 2(1967), Table 5-2.
- [35] Webster's Seventh New Collegiate Dictionary. Springfield: G. and C. Merriam Company, 1965.

APPENDIX A
INPUT DATA, ENDOGENOUS TO THE MODEL,
USED IN ALL SIMULATION RUNS

TABLE VIII
 THE PROBABILITY OF DEATH OF A MEMBER
 IN ANY ONE YEAR, BY AGE OF MEMBER

Probability of Death in Any One Year	Age Classification	
	Minimum Years of Age	Maximum Years of Age
.0030	0	5
.0023	6	10
.0024	11	15
.0070	16	20
.0091	21	25
.0080	26	30
.0089	31	35
.0131	36	40
.0204	41	45
.0337	46	50
.0548	51	55
.0862	56	60
.1282	61	65
.1823	66	70
.2640	71	75
.3478	76	80
.4636	81	85
.5800	86	90
.7000	91	95
.8200	96	100
.9000	101	105
1.0000	106	110

Source: Vital Statistics of the United States. Washington: Department of Health, Education and Welfare, National Center for Health Services, 2(1967), Table 5-2.

APPENDIX B
INPUT DATA, EXOGENOUS TO THE MODEL,
USED IN SIMULATION RUNS
ONE THROUGH FIVE

TABLE IX

INPUT DATA FOR COMPUTER RUN NUMBER ONE WITH
CORRESPONDING INPUT DECK CARD
NUMBER AND COLUMNS

Data Description	Numeric Value ^a	Card Number	Card Columns
1. Number of replications.	1	1	1-2
2. Number of years simulated.	10	1	4-5
3. Last year prior to simulation (last two digits)	71	1	7-8
4. Equity retirement options (code 1, 2, 3, 4, 5, 6, or 7, for plan 1, 2, 3, 4, 5, 6, or 7, respectively).	1	1	10
a. Plan 1 - retire "a" proportion (in decimal terms) of shares held by members "b" years of age or older, except for "c" dollars worth of stock (code 1).			
(i) value of "a".	1.0	2	1-3
(ii) value of "b".	65	2	5-6
(iii) value of "c".	0	2	8-11
b. Plan 2 (used in combination with plan 1.) - retire "d" proportion of shares held by members "e" years of age or older, except for "f" dollars worth of stock (code 2).			
(i) value of "d".	0	2	13-15
(ii) value of "e".	0	2	17-18
(iii) value of "f".	0	2	20-23
c. Plan 3 - retire "g" proportion of equities held by deceased members (code 3).			
(i) value of "g".	0	2	25-27
d. Plan 4 - retire "h" proportion equities held by patrons lost to competing firms (code 4).			
(i) value of "h".	0	2	29-31

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
e. Plan 5 - retire "i" proportion of equities held by retired or re-located members (code 5).			
(i) value of "i".	0	2	33-35
f. Plan 6 - retire "j" proportion of equities that are "k" or more years old (code 6).			
(i) value of "j".	0	2	37-39
(ii) value of "k".	0	2	41-42
g. Plan 7 (used in combination with plan 6) - retire "m" proportion of equities outstanding "n" or more years (code 7).			
(i) value of "m".	0	2	44-46
(ii) value of "n".	0	2	48-49
5. Insufficient funds options: sources of equity retirement funds allowed other than net margins and capital reserves (code 0, 1, 2, or 3).			
a. No other sources (code 0).	1	1	12
b. Borrowed funds only - maximum of three sources (code 1).			
(i) interest rate charged by Bank for Cooperatives in base year.	10	4	1-3
(ii) annual trend interest rates charged by Bank for Cooperatives.	0	4	5-7
(iii) number of annual payments on loans from Bank for Cooperatives.	10	4	9-10
(iv) maximum debt-equity ratio allowed by Bank for Cooperatives.	1.0	4	12-15
(v) interest rate charged by commercial lender in base year.	0	4	17-19
(vi) annual trend in interest rate charged by commercial lender.	0	4	21-23

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
(vii) number of annual payments on loans from commercial lender.	0	4	25-26
(viii) maximum debt-equity ratio allowed by commercial lender.	0	4	28-31
(ix) interest rate by individual lenders in base year.	0	4	33-35
(x) annual trend in interest rates charged by individual lenders.	0	4	37-39
(xi) number of annual payments on loans by individual lenders.	0	4	41-42
(xii) maximum debt-equity ratio allowed by individual lenders.	0	4	44-47
c. Preferred stocks exchanged for retired equities only (code 2).			
(i) maximum amount of preferred stock to be issued.	0	1	16-23
(ii) dividend rate on preferred stock.	0	3	1-3
d. Borrowed funds and preferred stock exchanged for retired equities (same sources of borrowed funds and maximum preferred stock exchange as above) (code 3).			
6. Minimum percentage of total equity due for retirement which the default retirement routine may use (code = percentage/10).	3	1	14
7. Retirement of local cooperative's stock in the regional cooperative, to assist in retirement of eligible local cooperative members' equity.			
a. Minimum age of local cooperative member whose equity retirement would qualify in the regional retirement program.	65	1	24-26

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
b. Maximum age of local cooperative member whose equity retirement would qualify in the regional retirement program (value less than 999 excludes deceased members).	999	1	28-30
c. Receivables from regional cooperative available for equity retirement at beginning of simulation period.	0	17	41-48
9. Number of years in which non-cash patronage refunds are used to calculate each members percentage of patronage.	4	1	32-33
Years used are as follows:			
a. First year.	68	1	35-36
b. Second year.	70	1	38-39
c. Third year.	71	1	41-42
d. Fourth year.	72	1	44-45
e. Fifth year (99 is the code for no year).	99	1	47-48
10. Minimum annual total patronage refund needed for allocation to members.	500	1	50-57
11. Years between executions of new capital investments for cooperative operations.	2	3	38-39
a. New long term liabilities for cooperative capital investments: in base year (first year of simulation) when executed.	5000	3	8-15
(i) annual trend in new long term liabilities.	0	3	17-24
(ii) number of annual payments on new long term liabilities.	3	3	35-36
b. Annual investments for cooperative operations from internal funds.	3000	3	40-47
(i) annual trend in investments for cooperative operations from internal funds.	0	3	49-56

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
13. Current liabilities outstanding at beginning of simulation.	0	16	10-17
a. Current liabilities due in base year.	170000	5	1-8
b. Annual trend in current operating liabilities.	1377	5	10-17
c. Standard deviation about trend in current operating liabilities.	0	5	19-26
14. Interest rate on annual operating loans.	12	5	28-30
15. Working capital in base year.	185000	5	32-39
a. Annual trend in working capital.	12000	5	41-48
b. Change in working capital per dollar of sales volume.	0	5	50-57
16. Sales volume in base year.	2000000	6	1-10
a. Annual trend in sales volume.	0	6	12-19
b. Standard deviation in sales volume.	0	6	21-28
17. Annual patronage retains.	0	6	30-35
a. Patronage retains per dollar of sales volume.	0	6	37-42
18. Annual margins in base year.	90000	6	44-51
a. Yearly trend in annual margins.	0	6	53-60
b. Change in annual margin per dollar of sales volume.	0	6	62-69
c. Standard deviation of annual margin.	0	6	71-76
19. Value of a common share.	100	7	1-4
20. Entry fee for new members.	0	7	6-8
21. Annual direct capital investment by active patron.	0	7	10-12
22. Number of new members in base year.	30	7	14-16
a. Annual trend in number of new members.	0	7	18-20
b. Standard deviation of number of new members.	0	7	22-24
23. Age of each new member in base year.	24	7	26-28
a. Annual trend in new member ages.	0	7	30-32

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
b. Standard deviation of number of new members.	0	7	34-36
24. Probability of a member moving from service area in base year.	0	7	38-42
a. Annual trend in probability of a member moving.	0	7	44-48
25. Probability of a member beginning to patronize a competitor in base year.	0	7	50-54
a. Annual trend in probability of switching patronage to a competitor.	0	7	56-50
26. Probability of attracting members back from competitors in base year.	0	7	62-66
a. Annual trend in probability of attracting members back from competitors.	0	7	68-72
27. Percentage of patronage by new members:			
a. Percentage of total patronage provided by new members in each of the following categories:			
(i) Category N-1.	.00038	8	1-8
(ii) Category N-2.	.000755	8	10-17
(iii) Category N-3	.0015	8	19-26
(iv) Category N-4.	.0	8	28-35
(v) Category N-5.	.0	8	37-44
(vi) Category N-6.	.0	8	46-53
(vii) Category N-7.	.0	8	55-62
b. Probability of a new member being in the following categories:			
(i) Category N-1.	.6	9	1-8
(ii) Category N-2.	.3	9	10-17
(iii) Category N-3.	.1	9	19-26
(iv) Category N-4.	.0	9	28-35
(v) Category N-5.	.0	9	37-44
(vi) Category N-6.	.0	9	46-53
(vii) Category N-7.	.0	9	55-62

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
28. Member retirement categories.			
a. Probability of a member retiring if his age is less than the maximum age for the following categories:			
(i) Category R-1.	.05	10	1-8
(ii) Category R-2.	.1	10	10-17
(iii) Category R-3.	.2	10	19-26
(iv) Category R-4.	.7	10	28-35
(v) Category R-5.	.7	10	37-44
(vi) Category R-6.	.8	10	46-53
(vii) Category R-7.	.9	10	55-62
(viii) Category R-8.	1.0	10	64-71
b. Maximum member age for the following member retirement categories:			
(i) Category R-1.	1	11	1-2
(ii) Category R-2.	51	11	4-5
(iii) Category R-3.	56	11	7-8
(iv) Category R-4.	61	11	10-11
(v) Category R-5.	66	11	13-14
(vi) Category R-6.	71	11	16-17
(vii) Category R-7.	76	11	19-20
(viii) Category R-8.	81	11	22-23
29. Minimum annual income taxes paid.	0	12	1-5
a. Income taxes paid per dollar on first portion of net margins.	.04	12	7-11
b. First portion of net margins.	0	12	19-28
c. Income taxes paid per dollar on remainder of net margins.	0	12	13-17
30. Proportion of net margins retained for statutory cash reserves.	.1	12	30-34
a. Beginning balance in statutory cash reserve.	107200	16	40-47
31. Proportion of net margins retained for additional cash reserves.	0	12	36-40

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
a. Maximum balance in additional cash reserves.	0	12	42-49
b. Initial balance in additional cash reserves.	0	16	49-56
32. Proportion of patronage refunds made in cash.	.2	12	51-55
33. Depreciation expense in base year.	0	13	1-8
a. Annual trend in depreciation expenses.	0	13	10-17
b. Annual depreciation expense per dollar of depreciable assets.	.04	13	19-23
c. Depreciable assets at beginning of simulation.	800000	17	10-19
d. Accumulated depreciation at beginning of simulation.	300000	17	21-30
34. Stock held in the regional cooperative at beginning of simulation.	60000	17	32-39
a. Annual non-cash patronage refund from regional cooperative.	3283	13	25-29
b. Non-cash patronage refunds from the regional cooperative per dollar of sales volume by the local.	.0023	13	31-35
35. Long term debts outstanding at beginning of prediction period.	60000	16	1-8
Repayment schedule:			
a. Principal payment due first year.	20000	14	9-16
b. Principal payment due second year.	20000	14	17-24
c. Principal payment due third year.	20000	14	25-32
d. Principal payment due fourth year.	0	14	33-40
e. Principal payment due fifth year.	0	14	41-48
f. Principal payment due sixth year.	0	14	49-56

TABLE IX (Continued)

Data Description	Numeric Value ^a	Card Number	Card Columns
g. Principal payment due seventh year.	0	14	57-64
h. Principal payment due eighth year.	0	14	65-72
i. Principal payment due ninth year.	0	14	65-72
j. Principal payment due tenth year.	0	14	73-80
36. Preferred stocks outstanding at beginning of simulation.	0	16	19-26
a. Cumulative dividends on preferred stock (1) or non cumulative dividends (0).	0	3	5-6
Preferred stock dividends payable at beginning of simulation by years as follows:			
(i) first year.	0	15	1-8
(ii) second year.	0	15	9-16
(iii) third year.	0	18	17-24
(iv) fourth year.	0	15	25-32
(v) fifth year.	0	15	33-40
(vi) sixth year.	0	15	41-48
(vii) seventh year.	0	15	49-56
(viii) eighth year.	0	15	57-64
(ix) ninth year.	0	15	65-72
(x) tenth year.	0	15	73-80
37. Number of stockholders in the cooperative at the beginning of the simulation.	1570	16	34-38
38. Initial balance in equity retirement fund.	18436	17	1-8
39. Value of land assets at the beginning of the simulation.	24000	17	59-66
40. Additions to net worth other than equities and cash reserves.	0	17	50-57

^aAll data are in integer format unless a decimal is shown.

TABLE X
 INPUT DATA FOR A "REPRESENTATIVE" COOPERATIVE
 MEMBER IN THE MEMBER INPUT DECK

Data Description	Value ^a	Card Number	Card Columns
1. Member name.	John D. Doe	1	3-20
2. Member number.	562	1	22-26
3. Member age in base year.	64	1	29-31
4. Number of stock credit credits on member's ledger.	3	1	32-33
a. Year of first stock credit credit.	65	2	9-10
b. Amount of first stock credit credit (in cents).	1111	2	11-16
c. Year of second stock credit credit.	67	2	17-18
d. Amount of second stock credit credit (in cents).	6952	2	19-24
e. Year of third stock credit credit.	68	2	25-26
f. Value of third stock credit credit (in cents).	143	2	27-32
6. Number of common stock credits.	2	1	34-35
a. Year of first common stock credit.	65	3	9-10
b. Value of first common stock credit (in cents).	20000	3	11-16
c. Year of second common stock credit.	67	3	17-18
d. Value of second common stock credit (in cents).	5000	3	19-24
7. Number of common stock debits.	1	1	40-41
a. Year of first common stock debit.	68	4	9-10
b. Value of first common stock debit (in cents).	15000	4	11-16
8. Number of stock credit debits.	1	1	42-43
a. Year of first stock credit debit.	68	4	9-10
b. Value of first stock credit debit (in cents).	5000	4	11-16

^aExcept for member name, all data are in integer format unless a decimal is shown.

TABLE XI
INPUT CHANGES FOR COMPUTER RUNS TWO THROUGH FIVE

Data Description	Numeric Value ^a	Data Card Number	Card Columns
A. Run number two.			
1. Equity retirement option (code 1, 2, 3, 4, 5, 6, 7).	3	1	10
a. Plan 3 retire "g" proportion of equities held by deceased members (code 3).			
(i) value of "g".	1.0	2	25-27
B. Run number three.			
1. Equity retirement option.	6	1	10
a. Plan 6 retire "j" proportion of equities that are "k" or more years old (code 6).			
(i) value of "j".	1.0	2	37-39
(ii) value of "k".	10	2	41-42
C. Run number four.			
1. Annual margins in base year.	40000	6	44-51
2. Yearly trend in annual margins.	10000	6	53-60
D. Run number five.			
1. Standard deviation of sales volume.	500000	6	21-28
2. Standard deviation of margin.	60000	6	71-76
3. Standard deviation of number of new members.	10	7	22-24
4. Standard deviation of ages of new members.	3	7	34-36

^aAll data are in integer format unless a decimal is shown.

APPENDIX C

OUTPUT FROM SIMULATION RUN NUMBER ONE

TABLE XII

AVERAGE MEMBER AGE ANALYSIS, BY YEAR; OUTPUT FROM SIMULATION RUN NUMBER ONE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Number of Stockholders	1,260. (0.0)	1,000. (0.0)	865. (0.0)	848. (0.0)	848. (0.0)	848. (0.0)	858. (0.0)	873. (0.0)	879. (0.0)	894. (0.0)	908. (0.0)
Average Age of Stockholders	59.90 (0.0)	56.51 (0.0)	53.94 (0.0)	51.49 (0.0)	49.19 (0.0)	47.33 (0.0)	45.43 (0.0)	43.95 (0.0)	42.51 (0.0)	41.62 (0.0)	40.33 (0.0)
Number of Active Stockholders	745. (0.0)	645. (0.0)	601. (0.0)	567. (0.0)	544. (0.0)	527. (0.0)	516. (0.0)	514. (0.0)	516. (0.0)	524. (0.0)	529. (0.0)

TABLE XIII

PRESENT YEAR'S ALLOCATION BY AGE OF MEMBER, AND BY YEAR; OUTPUT FROM SIMULATION RUN NUMBER ONE

Age Group	Years									
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1 - 5	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
6 - 10	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
11 - 15	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
16 - 20	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
21 - 25	2,921. (0.)	4,199. (0.)	2,641. (0.)	2,632. (0.)	2,333. (0.)	2,407. (0.)	2,655. (0.)	2,588. (0.)	2,620. (0.)	2,709. (0.)
26 - 30	1,797. (0.)	799 (0.)	3,823 (0.)	5,713 (0.)	7,384. (0.)	8,406. (0.)	10,143. (0.)	7,610. (0.)	7,813. (0.)	7,791. (0.)
31 - 35	1,423. (0.)	3,150 (0.)	3,723 (0.)	3,149. (0.)	3,456. (0.)	3,065. (0.)	519 (0.)	4,649 (0.)	6,509. (0.)	8,856. (0.)
36 - 40	3,211. (0.)	2,228 (0.)	1,983 (0.)	2,779. (0.)	2,074. (0.)	2,014. (0.)	4,376. (0.)	5,048 (0.)	5,137. (0.)	5,943. (0.)
41 - 45	7,853. (0.)	8,035 (0.)	8,086. (0.)	7,773. (0.)	6,813. (0.)	5,654. (0.)	3,566. (0.)	3,124. (0.)	2,900. (0.)	1,380. (0.)
46 - 50	8,729. (0.)	9,924. (0.)	10,845. (0.)	11,728. (0.)	11,788. (0.)	12,123. (0.)	13,076. (0.)	12,264. (0.)	12,745. (0.)	11,392. (0.)

TABLE XIII (Continued)

Age Group	Years									
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
51 - 55	15,003. (0.)	11,275. (0.)	10,750. (0.)	9,457. (0.)	11,115. (0.)	12,204. (0.)	13,595. (0.)	12,351. (0.)	11,352. (0.)	11,680. (0.)
56 - 60	8,682. (0.)	8,573. (0.)	11,548. (0.)	11,505. (0.)	11,588. (0.)	12,268. (0.)	5,759. (0.)	5,541. (0.)	6,318. (0.)	8,764. (0.)
61 - 65	3,762. (0.)	6,213. (0.)	2,737. (0.)	1,713. (0.)	1,869. (0.)	902. (0.)	5,601. (0.)	6,721. (0.)	4,614. (0.)	2,321. (0.)
66 - 70	4,296. (0.)	1,278. (0.)	1,211. (0.)	45. (0.)	25. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
71 - 75	655. (0.)	320. (0.)	18. (0.)	588. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
76 - 80	505. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
81 - 85	274. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
86 - 90	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
91 - 95	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
96 - 100	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
101 - 105	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
106 - 110	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)

TABLE XIII (Continued)

Age Group	Years									
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Unknown Ages	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
Organizations	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)	0. (0.)
Estates	3,097. (0.)	1,803. (0.)	874. (0.)	1,598. (0.)	677. (0.)	517. (0.)	711. (0.)	547. (0.)	875. (0.)	489. (0.)
Totals	62,206. (0.)	57,796. (0.)	58,237. (0.)	58,678. (0.)	59,119. (0.)	59,560. (0.)	60,001. (0.)	60,442. (0.)	60,883. (0.)	61,324. (0.)

TABLE XIV
MEMBER AGES AND EQUITY DISTRIBUTIONS, BY YEAR;
OUTPUT FROM SIMULATION RUN NUMBER ONE

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1971</u>		
1 - 5	1. 0.	13. 0.	0.0 0.0
6 - 10	0. 0.	0. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0
16 - 20	1. 0.	38. 0.	0.0 0.0
21 - 25	10. 0.	2,477. 0.	0.44 0.0
26 - 30	17. 0.	7,125. 0.	1.26 0.0
31 - 35	23. 0.	8,218. 0.	1.45 0.0
36 - 40	39. 0.	30,649. 0.	5.40 0.0
41 - 45	57. 0.	36,036. 0.	6.35 0.0
46 - 50	62. 0.	69,620. 0.	12.27 0.0
51 - 55	86. 0.	106,809. 0.	18.82 0.0
56 - 60	67. 0.	91,276. 0.	16.08 0.0
61 - 65	97. 0.	68,406. 0.	12.05 0.0
66 - 70	88. 0.	29,363. 0.	5.17 0.0
71 - 75	56. 0.	19,840. 0.	3.50 0.0
76 - 80	69. 0.	25,816. 0.	4.55 0.0
81 - 85	45. 0.	16,752. 0.	2.95 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1971 con't</u>		
86 - 90	13. 0.	4,163. 0.	0.73 0.0
91 - 95	10. 0.	2,077. 0.	0.37 0.0
96 - 100	3. 0.	32. 0.	0.0 0.0
101 - 105	1. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,569. 0.	8.21 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	50. 0.	2,502. 0.	0.44 0.0
Totals	1,570. 0.	567,752. 0.	100.04 0.0
Coefficient of Equity-Age	-	56.52	
Standard Deviation of Equity-Age	-		
Coefficients over Replications	-	0.0	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	
	<u>1972</u>		
1 - 5	1. 0.	13. 0.	0.0 0.0
6 - 10	0. 0.	0. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	39. 0.	4,615. 0.	0.96 0.0
26 - 30	12. 0.	8,493. 0.	1.77 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1972 (con't)</u>		
31 - 35	24. 0.	7,764. 0.	1.62 0.
36 - 40	28. 0.	24,154. 0.	5.04 0.0
41 - 45	56. 0.	48,298. 0.	10.07 0.0
46 - 50	52. 0.	70,196. 0.	14.64 0.0
51 - 55	90. 0.	114,779. 0.	23.94 0.0
56 - 60	53. 0.	78,638. 0.	16.40 0.0
61 - 65	65. 0.	50,998. 0.	10.64 0.0
66 - 70	62. 0.	4,296. 0.	0.90 0.0
71 - 75	35. 0.	655. 0.	0.14 0.0
76 - 80	33. 0.	505. 0.	0.11 0.0
81 - 85	16. 0.	274. 0.	0.06 0.0
86 - 90	3. 0.	0. 0.	0.0 0.0
91 - 95	2. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	9.64 0.0
Organizations	0. 0.	0. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1972 (con't)</u>			
Estates	254.	19,531.	4.07
	0.	0.	0.0
Totals	1,600.	479,418.	100.00
	0.	0.	0.0
Coefficient of Equity-Age	-	51.40	
Standard Deviation of Equity-Age			
Coefficients over Replications	-	0.0	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	
<u>1973</u>			
1 - 5	0.	0.	0.0
	0.	0.	0.0
6 - 10	1.	13.	0.0
	0.	0.	0.0
11 - 15	0.	0.	0.0
	0.	0.	0.0
16 - 20	0.	0.	0.0
	0.	0.	0.0
21 - 25	66.	8,005.	1.58
	0.	0.	0.0
26 - 30	9.	4,178.	0.83
	0.	0.	0.0
31 - 35	24.	16,528.	3.27
	0.	0.	0.0
36 - 40	22.	17,732.	3.51
	0.	0.	0.0
41 - 45	56.	51,052.	10.10
	0.	0.	0.0
46 - 50	51.	75,932.	15.02
	0.	0.	0.0
51 - 55	74.	102,218.	20.22
	0.	0.	0.0
56 - 60	54.	79,232.	15.67
	0.	0.	0.0
61 - 65	63.	79,372.	15.70
	0.	0.	0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1973 (con't)</u>		
66 - 70	50. 0.	1,278. 0.	0.25 0.0
71 - 75	29. 0.	320. 0.	0.06 0.0
76 - 80	22. 0.	0. 0.	0.0 0.0
81 - 85	11. 0.	0. 0.	0.0 0.0
86 - 90	5. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	9.15 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	318. 0.	23,471. 0.	4.64 0.0
Totals	1,630. 0.	505,544. 0.	100.00 0.0
Coefficient of Equity-Age		- 51.38	
Standard Deviation of Equity-Age			
Coefficient over Replications		- 0.0	
Retirement Plan in Use		- 1	
Financing Option Used		- 1	
Insufficient Funds Option Used		- 3	

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1974</u>		
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	1. 0.	13. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	64. 0.	5,146. 0.	0.98 0.0
26 - 30	36. 0.	11,706. 0.	2.22 0.0
31 - 35	22. 0.	20,669. 0.	3.93 0.0
36 - 40	21. 0.	17,501. 0.	3.32 0.0
41 - 45	48. 0.	52,960. 0.	10.05 0.0
46 - 50	52. 0.	78,067. 0.	14.81 0.0
51 - 55	66. 0.	99,985. 0.	18.96 0.0
56 - 60	56. 0.	104,829. 0.	19.88 0.0
61 - 65	55. 0.	66,043. 0.	12.53 0.0
66 - 70	45. 0.	1,211. 0.	0.23 0.0
71 - 75	28. 0.	18. 0.	0.0 0.0
76 - 80	12. 0.	0. 0.	0.0 0.0
81 - 85	6. 0.	0. 0.	0.0 0.0
86 - 90	2. 0.	0. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1974 (con't)</u>			
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233 0.	8.77 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	371. 0.	22,823. 0.	4.33 0.0
Totals	1,660. 0.	527,213. 0.	100.00 0.0
Coefficient of Equity-Age		- 51.06	
Standard Deviation of Equity-Age			
Coefficients over Replications		- 0.0	
Retirement Plan in Use		- 1	
Financing Option Used		- 1	
Insufficient Funds Option Used		- 3	
<u>1975</u>			
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	0. 0.	13. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	63. 0.	5,062. 0.	0.91 0.0
26 - 30	65. 0.	19,747. 0.	3.56 0.0
31 - 35	16. 0.	17,554. 0.	3.16 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1975 (con't)</u>		
36 - 40	23. 0.	19,982. 0.	3.60 0.0
41 - 45	41. 0.	57,003. 0.	10.27 0.0
46 - 50	53. 0.	79,847 0.	14.38 0.0
51 - 55	52. 0.	91,535. 0.	16.49 0.0
56 - 60	59. 0.	120,411. 0.	21.69 0.0
61 - 65	43. 0.	47,294. 0.	8.52 0.0
66 - 70	35. 0.	45. 0.	0.0 0.0
71 - 75	29. 0.	588. 0.	0.11 0.0
76 - 80	10. 0.	0. 0.	0.0 0.0
81 - 85	5. 0.	0. 0.	0.0 0.0
86 - 90	2. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	8.33 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	418. 0.	49,861. 0.	8.98 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1975 (con't)</u>			
Totals	1,690. 0.	555,154. 0.	100.00 0.0
Coefficient of Equity-Age		- 50.38	
Standard Deviation of Equity-Age			
Coefficients over Replications		- 0.0	
Retirement Plan in Use		- 1	
Financing Option Used		- 1	
Insufficient Funds Option Used		- 3	
<u>1976</u>			
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	1. 0.	13. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	60. 0.	3,576. 0.	0.65 0.0
26 - 30	95. 0.	30,720. 0.	5.55 0.0
31 - 35	14. 0.	20,714. 0.	3.75 0.0
36 - 40	21. 0.	15,894. 0.	2.87 0.0
41 - 45	34. 0.	54,096. 0.	9.78 0.0
46 - 50	54. 0.	82,854. 0.	14.98 0.0
51 - 55	49. 0.	111,790. 0.	20.21 0.0
56 - 60	53. 0.	126,777. 0.	22.92 0.0
61 - 65	35. 0.	48,063. 0.	8.69 0.0
66 - 70	39. 0.	25. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1976 (con't)</u>			
71 - 75	25. 0.	0. 0.	0.0 0.0
76 - 80	0. 0.	0. 0.	0.0 0.0
81 - 85	6. 0.	0. 0.	0.0 0.0
86 - 90	0. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	8.36 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	459. 0.	12,301. 0.	2.22 0.0
Totals	1,720. 0.	553,038. 0.	100.00 0.0
Coefficient of Equity-Age		- 50.27	
Standard Deviation of Equity-Age			
Coefficients over Replications		- 0.0	
Retirement Plan in Use		- 1	
Financing Option Used		- 1	
Insufficient Funds Option Used		- 3	
<u>1977</u>			
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	1. 0.	13. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1977 (con't)</u>		
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	60. 0.	3,529. 0.	0.60 0.0
26 - 30	122. 0.	38,735. 0.	6.63 0.0
31 - 35	11. 0.	21,485. 0.	3.68 0.0
36 - 40	21. 0.	17,569. 0.	3.01 0.0
41 - 45	26. 0.	46,464. 0.	7.96 0.0
46 - 50	50. 0.	91,730. 0.	15.71 0.0
51 - 55	46. 0.	124,574. 0.	21.33 0.0
56 - 60	60. 0.	140,197. 0.	24.01 0.0
61 - 65	33. 0.	45,935. 0.	7.87 0.0
66 - 70	27. 0.	0. 0.	0.0 0.0
71 - 75	23. 0.	0. 0.	0.0 0.0
76 - 80	1. 0.	0. 0.	0.0 0.0
81 - 85	3. 0.	0. 0.	0.0 0.0
86 - 90	0. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1977 (con't)</u>			
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	7.92 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	491. 0.	7,488. 0.	1.28 0.0
Totals	1,750. 0.	583,934. 0.	100.00 0.0
Coefficient of Equity-Age	-	50.29	
Standard Deviation of Equity-Age	-	0.0	
Coefficients over Replications	-	1	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	
<u>1978</u>			
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	1. 0.	13. 0.	0.0 0.0
11 - 15	0. 0.	0. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	60. 0.	3,863. 0.	0.61 0.0
26 - 30	150. 0.	49,217. 0.	7.80 0.0
31 - 35	7. 0.	8,076. 0.	1.28 0.0
36 - 40	24. 0.	37,777. 0.	5.98 0.0
41 - 45	18. 0.	31,478. 0.	4.99 0.0
46 - 50	52. 0.	102,526. 0.	16.24 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1978 (con't)</u>			
51 - 55	42. 0.	124,730. 0.	19.76 0.0
56 - 60	51. 0.	110,122. 0.	17.45 0.0
61 - 65	35. 0.	93,122. 0.	14.75 0.0
66 - 70	26. 0.	0. 0.	0.0 0.0
71 - 75	14. 0.	0. 0.	0.0 0.0
76 - 80	5. 0.	0. 0.	0.0 0.0
81 - 85	1. 0.	0. 0.	0.0 0.0
86 - 90	0. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	7.32 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	519. 0.	24,093. 0.	3.82 0.0
Totals	1,780. 0.	631,230. 0.	100.00 0.0
Coefficient of Equity-Age	-	50.35	
Standard Deviation of Equity-Age	-		
Coefficients over Replications	-	0.0	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1979</u>		
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	0. 0.	0. 0.	0.0 0.0
11 - 15	1. 0.	13. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	60. 0.	3,932. 0.	0.60 0.0
26 - 30	149. 0.	35,254. 0.	5.39 0.0
31 - 35	35. 0.	34,177. 0.	5.23 0.0
36 - 40	22. 0.	44,042. 0.	6.73 0.0
41 - 45	19. 0.	30,716. 0.	4.70 0.0
46 - 50	42. 0.	99,656. 0.	15.24 0.0
51 - 55	43. 0.	122,218. 0.	18.69 0.0
56 - 60	39. 0.	101,279. 0.	15.49 0.0
61 - 65	39. 0.	112,985. 0.	17.28 0.0
66 - 70	25. 0.	0. 0.	0.0 0.0
71 - 75	14. 0.	0. 0.	0.0 0.0
76 - 80	5. 0.	0. 0.	0.0 0.0
81 - 85	0. 0.	0. 0.	0.0 0.0
86 - 90	1. 0.	0. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1979 (con't)</u>			
91 - 96	0.	0.	0.0
	0.	0.	0.0
96 - 100	0.	0.	0.0
	0.	0.	0.0
101 - 105	0.	0.	0.0
	0.	0.	0.0
106 - 110	0.	0.	0.0
	0.	0.	0.0
Unknown Ages	775.	46,233.	7.07
	0.	0.	0.0
Organizations	0.	0.	0.0
	0.	0.	0.0
Estates	541.	23,507.	3.59
	0.	0.	0.0
Totals	1,810.	653,992.	100.00
	0.	0.	0.0
Coefficient of Equity-Age	-	50.17	
Standard Deviation of Equity-Age			
Coefficients over Replications	-	0.0	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	
<u>1980</u>			
1 - 5	0.	0.	0.0
	0.	0.	0.0
6 - 10	0.	0.	0.0
	0.	0.	0.0
11 - 15	1.	13.	0.0
	0.	0.	0.0
16 - 20	0.	0.	0.0
	0.	0.	0.0
21 - 25	60.	3,763.	0.55
	0.	0.	0.0
26 - 30	151.	35,748.	5.26
	0.	0.	0.0
31 - 35	62.	49,883.	7.34
	0.	0.	0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1980 (con't)</u>		
36 - 40	15. 0.	38,713. 0.	5.70 0.0
41 - 45	21. 0.	33,582. 0.	4.94 0.0
46 - 50	39. 0.	108,903. 0.	16.03 0.0
51 - 55	44. 0.	131,896. 0.	19.42 0.0
56 - 60	38. 0.	106,355. 0.	15.66 0.0
61 - 65	33. 0.	99,386. 0.	14.63 0.0
66 - 70	20. 0.	0. 0.	0.0 0.0
71 - 75	9. 0.	0. 0.	0.0 0.0
76 - 80	6. 0.	0. 0.	0.0 0.0
81 - 85	0. 0.	0. 0.	0.0 0.0
86 - 90	0. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	6.81 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	566. 0	24,886. 0.	3.66 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
<u>1980 (con't)</u>			
Totals	1,840. 0.	679,342. 0.	100.00 0.0
Coefficient of Equity-Age	-	49.86	
Standard Deviation of Equity-Age	-	0.0	
Coefficients over Replications	-	1	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	
<u>1981</u>			
1 - 5	0. 0.	0. 0.	0.0 0.0
6 - 10	0. 0.	0. 0.	0.0 0.0
11 - 15	1. 0.	13. 0.	0.0 0.0
16 - 20	0. 0.	0. 0.	0.0 0.0
21 - 25	60. 0.	4,109. 0.	0.58 0.0
26 - 30	148. 0.	33,780. 0.	4.79 0.0
31 - 35	92. 0.	70,134. 0.	9.95 0.0
36 - 40	13. 0.	44,382. 0.	6.30 0.0
41 - 45	20. 0.	22,979. 0.	3.26 0.0
46 - 50	32. 0.	98,062. 0.	13.91 0.0
51 - 55	43. 0.	135,042. 0.	19.16 0.0
56 - 60	36. 0.	137,092. 0.	19.45 0.0
61 - 65	35. 0.	104,199. 0.	14.79 0.0
66 - 70	15. 0.	0. 0.	0.0 0.0

TABLE XIV (Continued)

Age Group	Number of Stockholders	Amount of Stock Held	Percentage of Total Stock
	<u>1981 (con't)</u>		
71 - 75	10. 0.	0. 0.	0.0 0.0
76 - 80	3. 0.	0. 0.	0.0 0.0
81 - 85	0. 0.	0. 0.	0.0 0.0
86 - 90	0. 0.	0. 0.	0.0 0.0
91 - 95	0. 0.	0. 0.	0.0 0.0
96 - 100	0. 0.	0. 0.	0.0 0.0
101 - 105	0. 0.	0. 0.	0.0 0.0
106 - 110	0. 0.	0. 0.	0.0 0.0
Unknown Ages	775. 0.	46,233. 0.	6.56 0.0
Organizations	0. 0.	0. 0.	0.0 0.0
Estates	587. 0.	8,731. 0.	1.24 0.0
Totals	1,870. 0.	704,735. 0.	100.00 0.0
Coefficient of Equity-Age	-	49.98	
Standard Deviation of Equity-Age	-		
Coefficients over Replications	-	0.0	
Retirement Plan in Use	-	1	
Financing Option Used	-	1	
Insufficient Funds Option Used	-	3	

TABLE XV

ANALYSIS OF CHANGES IN COOPERATIVE FINANCIAL POSITION, BY YEAR; OUTPUT FROM SIMULATION RUN NUMBER ONE

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Net Margin (Gross Margin Less Taxes and Interest)	0.0 0.0	86,400.0 0.0	80,274.0 0.0	80,887.0 0.0	81,500.0 0.0	82,112.0 0.0	82,725.0 0.0	83,337.0 0.0	83,950.0 0.0	84,562.0 0.0	85,175.0 0.0
Gross Margin	0.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0	90,000.0 0.0
Interest Payments to Banks for Cooperatives	0.0 0.0	0.0 0.0	6,126.0 0.0	5,513.0 0.0	4,900.0 0.0	4,288.0 0.0	3,675.0 0.0	3,063.0 0.0	2,450.0 0.0	1,838.0 0.0	1,225.0 0.0
Interest Payments to Commercial Lenders	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
Interest Payments to Individuals	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
Income Taxes Paid	0.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0	3,600.0 0.0
Dividends Paid on Preferred Stock	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
Ratio of Net Margin to Net Worth	0.0 0.0	0.15 0.0	0.13 0.0	0.12 0.0	0.12 0.0	0.12 0.0	0.11 0.0	0.10 0.0	0.10 0.0	0.10 0.0	0.10 0.0
Ratio of Net Margin to Outstanding Equity	0.0 0.0	0.18 0.0	0.16 0.0	0.15 0.0	0.15 0.0	0.15 0.0	0.14 0.0	0.13 0.0	0.13 0.0	0.12 0.0	0.12 0.0
Interest Coverage	0.0 0.0	9,999.99 0.0	19.33 0.0	21.53 0.0	24.23 0.0	27.76 0.0	32.39 0.0	38.97 0.0	48.71 0.0	65.13 0.0	97.69 0.0
Ratio of Fixed Assets to Net Worth	0.78 0.0	0.83 0.0	0.73 0.0	0.66 0.0	0.58 0.0	0.54 0.0	0.47 0.0	0.40 0.0	0.35 0.0	0.31 0.0	0.26 0.0
Total Payments on Long Term Debts	0.0 0.0	20,000.0 0.0	26,125.50 0.0	27,792.17 0.0	7,792.17 0.0	9,458.83 0.0	9,458.83 0.0	9,458.83 0.0	9,458.83 0.0	9,458.83 0.0	9,458.83 0.0
Outstanding Long Term Debts to Banks for Cooperatives	0.0 0.0	61,255.06 0.0	55,129.56 0.0	49,004.05 0.0	42,878.55 0.0	36,753.05 0.0	30,627.54 0.0	24,502.04 0.0	18,376.54 0.0	12,251.03 0.0	6,125.53 0.0
Outstanding Long Term Debts to Commercial Lenders	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0

TABLE XV (Continued)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Long Term Debts	0.0	61,255.06	5,000.00	0.0	5,000.0	0.0	5,000.0	0.0	5,000.0	0.0	5,000.0
Incurred this Year	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fixed Charges Coverage	0.0	5.92	3.67	3.56	9.35	8.66	9.06	9.53	10.02	10.59	11.20
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proposed Equity and	0.0	0.69	1.85	1.70	2.73	1.59	2.85	4.73	2.41	2.56	2.57
Fixed Charges Coverage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Change in Working											
Capital taken from	0.0	12,000.0	12,000.0	12,000.00	12,000.0	12,000.0	12,000.0	12,000.0	12,000.0	12,000.0	12,000.0
Margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Accumulated	300,000.0	331,999.94	363,999.88	396,319.81	428,639.75	461,279.69	493,919.63	526,879.56	559,839.50	593,119.44	626,399.38
Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE XVI

ANALYSIS OF MEMBER EQUITY RETIREMENT FINANCING, BY YEAR; OUTPUT FROM SIMULATION RUN NUMBER ONE

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Outstanding Member Equity	567,532.81	479,417.81	505,544.19	527,212.94	555,154.00	553,038.38	583,933.56	631,229.81	653,991.88	679,341.69	704,735.00
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ratio of Actual Equity Retirement to Total Outstanding Member Equity	0.0	0.31	0.06	0.07	0.06	0.11	0.05	0.02	0.06	0.05	0.05
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ratio - Intended Equity Retirement to Total Outstanding Member Equity	0.0	0.31	0.06	0.07	0.06	0.11	0.05	0.02	0.06	0.05	0.05
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ratio of Cash Equity Retirement to Total Outstanding Member Equity	0.0	0.31	0.06	0.07	0.06	0.11	0.05	0.02	0.06	0.05	0.05
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cash Payments to Members (Cash Refunds and Cash Equity Retirement)	0.0	166,090.94	46,123.76	51,127.52	45,407.41	76,016.56	43,556.03	27,705.55	52,792.02	50,754.81	51,260.54
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cash Patronage Refunds	0.0	15,552.00	14,449.40	14,559.65	14,669.91	14,780.17	14,890.43	15,000.70	15,110.95	15,221.21	15,331.47
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cash Equity Retirement this Year	0.0	150,539.00	31,674.36	36,567.87	30,737.50	61,236.40	28,665.60	12,704.86	37,681.08	35,533.60	35,929.07
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cash Retirement from Regional	0.0	0.0	23,737.31	3,752.91	4,441.97	3,736.34	7,931.28	3,513.93	1,528.65	4,742.11	4,469.27
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cash Equity Retirement to Date	0.0	150,539.0	182,213.31	218,781.13	249,518.56	310,754.94	339,420.50	352,125.31	389,806.38	425,339.94	461,269.00
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Preferred Shares Issued this Year	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Member Equity Retired this Year	0.0	150,539.00	31,674.36	36,567.87	30,737.50	61,236.40	28,665.60	12,704.86	37,681.08	35,533.60	35,929.07
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE XVI (Continued)

	Years										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Member Equity Retired to Date	0.0	150,539.00	182,213.31	218,781.13	249,518.56	310,754.94	339,420.50	352,125.31	389,806.38	425,339.94	461,269.00
Member Equity Allocation for Retirement by Retirement Plan	0.0	150,539.00	31,674.36	36,567.87	30,737.50	61,236.40	28,665.60	12,704.86	37,681.08	35,533.60	35,929.07
Total Member Equity Allocated for Retirement to Date	0.0	150,539.00	182,213.31	218,781.13	249,518.56	310,754.94	339,420.50	352,125.31	389,806.38	425,339.94	461,269.00
Total Patronage Retains	0.0	62,208.00	57,797.60	58,238.60	58,679.65	59,120.70	59,561.75	60,002.80	60,443.80	60,884.85	61,325.90
Ratio of Total Outstanding Debts to Total Member Equity	0.0	0.21	0.16	0.10	0.09	0.07	0.06	0.04	0.04	0.02	0.02
Ratio of Total Long Term Debts to Common and Preferred Stock	0.0	0.21	0.16	0.10	0.09	0.07	0.06	0.04	0.04	0.02	0.02
Total Long Term Debt Incurred this Year	0.0	61,255.06	5,000.00	0.0	5,000.00	0.0	5,000.00	0.0	5,000.00	0.0	5,000.00
Total Outstanding Long Term Debts to Date	60,000.0	101,255.06	80,129.50	52,337.39	49,545.21	40,086.38	37,294.21	27,835.37	25,043.20	15,584.36	12,792.19
Total Number of New Members this Year	0.0	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Ratio of New Members to Date to Total Active Members	0.0	0.05	0.10	0.16	0.22	0.28	0.35	0.41	0.47	0.52	0.57
Total Patronage Retains this Year's New Members	0.0	2,589.46	1,221.63	1,232.44	1,214.52	1,121.74	1,208.49	1,343.58	1,142.97	1,400.05	1,118.67
Number of Members Which Became Inactive this Year	0.0	217.0	93.0	84.0	63.0	61.0	53.0	44.0	36.0	52.0	35.0
Statutory Cash Reserves	107,200.0	115,839.94	123,867.38	131,956.06	140,106.00	148,317.19	156,589.63	164,923.31	173,318.25	181,774.44	190,291.88
Balance in Retirement Fund	18,436.00	0.0	48,762.26	74,802.31	124,864.13	145,877.00	201,157.94	271,804.50	312,991.81	363,362.38	410,566.94
Investment by Member Other than Patronage Retains	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX D

INPUT DATA SURVEY FORM FOR
AGRICULTURAL COOPERATIVES

AGCORPS INPUT DATA QUESTIONNAIRE

AGCORPS (the Agricultural Cooperatives' Ownership Retirement Planning System) is a forecasting tool to assist you, the cooperative manager, in financing the retirement of shares held by retired, inactive, or deceased members. This computer routine will predict your firm's financial position and equity retirement progress over the next ten years based upon the information you provide in the following questions. All data will be considered confidential.

I. Type of Predictions Desired

- _____ (1) The model will predict trends for your association up to ten years from the present. How many years do you want to predict?
- _____ (2) Do you want to predict general trends only (deterministic) or do you also want to consider yearly variations in items like net margins and sales volume (probabilistic)?
- _____ (3) If you want to include the normal yearly variations in the models predictions, how many replications should the model be run?

II. Cooperative Earnings from Operations

- _____ (1) On the average, what are the yearly net earnings of your association?
- _____ (2) Over the long run, are average net earnings increasing, decreasing, or remaining about the same?
- _____ (3) If average net earnings are increasing or decreasing, by what percentage? _____%

_____ (4) Within what average range do you expect your association's average net earnings to fall in two out of every three years?

Top of range \$ _____

Bottom of range \$ _____

_____ (5) On the average, what percent of net earnings are paid in taxes each year? (Include federal, state, and local income and property taxes.)

Optional: The model is designed to tax income at two rates if desired.

_____ Tax rate on the first portion of net margin ÷ 100.

_____ First portion of net margin taxed at above rate.

_____ Tax rate on the second portion of net margin ÷ 100.

_____ (6) On the average, what is the total yearly sales volume of your firm?

_____ (7) Are sales volumes increasing, decreasing, or remaining about the same each year?

_____ (8) If sales volumes are increasing or decreasing, by what percent are they changing per year?

_____ (9) Within what average range, would you expect total sales volumes to fall in two out of every three years?

Top of range \$ _____

Bottom of range \$ _____

_____ (10) If sales volumes increase by 10%, by what percent would you expect net margins to increase or decrease? _____%

_____ (11) What is the minimum net after-tax-margin below which your cooperative's Board of Directors would not issue patronage refunds?

_____ (12) What percent of the total patronage refund is usually in cash?

What recent year(s) do you feel best represents normal patronage by your active members (please select years in which patronage refunds were made)?

III. Financing the Cooperative

_____ (1) On the average, how much operating capital does your cooperative require each year?

_____ (2) Does your association anticipate major purchases of plant and equipment in the future?

_____ (3) On the average, how often are these purchases expected to occur? (every X years)

_____ (4) On the average, how much total capital will be needed for each purchase?

_____ (5) Of the total capital needed for each purchase, what percent would you expect to come from the cooperative's cash reserves?

_____ (6) Of the total capital needed for each purchase, what percent would you expect to be borrowed capital?

_____ (7) What interest rate do you expect to pay to finance these purchases?

_____ (8) For how many years will these purchases be financed?

_____ (9) On the average, what is the yearly value of your firm's current liabilities? (Do not include operating loss carry overs.)

_____ (10) Are your current liabilities increasing, decreasing, or remaining about the same from year to year?

- _____ (11) By what percentage are they increasing or decreasing?
- _____ (12) What is the total value of long-term liabilities presently outstanding?
- (13) List below the payment schedule on existing long-term liabilities for the next ten years.
- | | | |
|-------------------|-------------------|--------------------|
| \$ _____ 1st year | \$ _____ 5th year | \$ _____ 8th year |
| \$ _____ 2nd year | \$ _____ 6th year | \$ _____ 9th year |
| \$ _____ 3rd year | \$ _____ 7th year | \$ _____ 10th year |
| \$ _____ 4th year | | |
- _____ (14) What interest rate do you usually have to pay on loans for operating loss carry overs?

IV. Financial Assets

- _____ (1) On the average, what percent of net earnings are added to statutory reserves each year?
- _____ (2) Does your cooperative have an additional cash reserve for future investments?
- _____ (3) What percent of net earnings is set aside for secondary reserves, if any?
- _____ (4) What is the maximum amount to be placed in these secondary cash reserves?
- _____ (5) What is the total value of your association's shares in Farmland Industries, Inc.? (Include common and preferred shares only.)
- _____ (6) Do your yearly stock refunds from Farmland Industries appear to increase or remain about the same when your association's sales volume increases?

- _____ (7) On the average, how many dollars of stock patronage re-
funds from Farmland Industries do you usually expect per
dollar of total sales?
- _____ (8) On the average, what is the dollar value of your associa-
tion's yearly stock refund from Farmland Industries?
- _____ (9) What is the total original value of your firm's deprecia-
ble assets? (do not set against accumulated depreciation)
- _____ (10) What is the total accumulated depreciation to date on your
cooperative's depreciable assets?
- _____ (11) Approximately what percent of the assets' original value
will be depreciated each year over the next ten years?
- _____ (12) What is the book value of your other non-depreciable
fixed assets (land, for example)?

V. New Member Information

- _____ (1) On the average, how many new members do you issue stock
to each year? (New members are people to whom no stocks
or stock credits have ever been issued.)
- _____ (2) Within what range would you expect the number of new
members entering the cooperative to fall two out of
every three years?
- Top of range: _____ new members
- Bottom of range: _____ new members
- _____ (3) Is the number of new members entering the cooperative
increasing, decreasing, or remaining about the same over
the years?
- _____ (4) On the average, by how many members per year if the number
of new members increasing or decreasing?

- _____ (5) What is the average age of the new members?
- _____ (6) Excepting the unusual member, what is the normal age range for these new members?
- Top of range: _____ years of age.
- Bottom of range: _____ years of age.
- (7) What percentage of the new members fall into each of the following categories according to the total value of their yearly non-cash patronage refund (pick an "average" year)?

<u>Percentage of New Members</u>	<u>Dollars of Stock Issued</u>
_____ %	Under \$10
_____ %	\$10 to \$25
_____ %	\$26 to \$50
_____ %	\$51 to \$100
_____ %	\$101 to \$200
_____ %	\$201 to \$500
_____ %	over \$500

- _____ (8) What was the cooperative's total non-cash patronage refund for that "average" year?
- _____ (9) When new members enter the association, are they required to directly purchase voting shares? (When common shares issued as patronage refunds are used as voting shares, answer no.)
- _____ (10) What is the dollar value of these shares?
- _____ (11) Are these voting shares redeemable?

VI. Member Loss Information

- _____ (1) How many active members do you have at present? (An active member is one who patronizes the cooperative at

least every two years.)

- _____ a. Has the number of active members in your cooperative increased, decreased, or remained about the same in the past five years?
- _____ b. By what percentage did it increase or decrease each year?
- _____ (2) On the average, how many members quit doing business with your cooperative each year because they have:
- _____ a. retired from farming?
- _____ b. moved out of your service area?
- _____ c. taken their business to a competitor?
- _____ d. died?
- (3) Of the members who retire from farming, what percent fall into the following age categories?

<u>Years of Age</u>	<u>Percentage of Inactive Members</u>
50 or under	_____ %
51 to 65	_____ %
66 to 70	_____ %
71 to 75	_____ %
76 to 80	_____ %
over 80	_____ %

- (4) Of the members who retire, die or move away, what percentage of their patronage is:
- _____ a. replaced by a new coop member taking over their farm?
- _____ b. replaced by an established coop member taking over their farm?
- _____ c. not replaced by a coop member?

VITA

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Master of Science

Thesis: A COMPUTERIZED OWNERSHIP RETIREMENT PLANNING SYSTEM FOR
AGRICULTURAL COOPERATIVES

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