

# DYNAMICS OF COOPERATIVE DEVELOPMENT

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## ABSTRACT

This paper describes a System Dynamic approach to the study of the relationship between people participation in Agricultural Land Reform Cooperative performance and the economic performance over time. Two Cooperatives are examined - "successful" and "non-successful" - and policy changes are discussed in terms of the performance of these two Cooperatives.

## 1. INTRODUCTION

Agricultural cooperatives in Thailand, have been in existence for 72 years since 1918, and were originally set up to relieve farmers from severe indebtedness effected by the lack of security in yield and price of agricultural products such that the farmers gradually became dependent on capitalists and middlemen. Although cooperatives have thus far applied as tool for economic development in terms of credit and marketing guarantee throughout Thailand, there has been little sign of pragmatic success.(1) A survey of 853 agricultural and land settlement cooperatives conducted during 1983 to 1985 to review and reclassify the cooperatives in terms of their performance showed that only 245 or 29% were upgraded, 14% were degraded and 489 (57%) were undeveloped. The grade classification was done on the basis of three factors -administration & management, financial status and business surplus. According to Kasemsun Chinavaso and Chuliporn Saetang (1986) that problems inherent in implementing a cooperative process are strongly related to the target group and people participation. The proper management of people participation, services and finance through moral involvement within the organization leads to the progress or success of a cooperative.

In practice, however, in order to meet cooperative goal of improving farmers economically through self-help, it seems inappropriate for farmers to organize and manage these business activities since they have been less educated and do not readily comprehend the process. In addition, the operation is somewhat time-consuming and requires specialized administrators.

The introduction of agricultural cooperatives in rural development programs usually diffuses in a local population

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(1) Report of the grade classification results of the Agricultural and Land Settlement Cooperative(1985).by the Cooperatives Promotion Department(Thailand) et al.,p.15.

without a bottom-up approach. So far several farmer organizations have failed to adopt cooperatives to improve their economic effectiveness. The literature has focused on the problems of inadequate training for members and less aid from government to replace certain roles of middlemen which strongly influence credit and marketing. Therefore, whether ineffective performance depends on the mismanagement of member cooperation and services within the organization rather than on government concerns from the outside is still debatable.

Previous research fail to explicitly explain the success of cooperative implementation and its ability to maintain its performance over time. Evaluations have certainly been done on the economic aspects but less attention has been given to the social behavior which augments cooperative development.

This paper presents a system dynamics simulation model which has been developed to study the diffusion patterns of cooperative innovation in a land reform area, with a discussion of contributions and possible improvements in the ineffective performance. Furthermore, the model would be applied as a tool for evaluating existing cooperatives and improving farmers' understanding.

The model addresses both the adoption and the changing extent of participation in activities, and endogenously accounts for changes in actual and perceived performance. Two case studies, the Ladbualuang Agricultural Land Reform Cooperative Ltd. (LALRC), Ayudthaya Province and the Banglane Agricultural Land Reform Cooperative Ltd.(BALRC), Nakornpathom Province provide the background of an unsuccessful and a successful for cooperative respectively as input to the model and to verify the model's ability to reproduce various aspects of historical behavior.

## 2. THEORETICAL BACKGROUND OF THE MODEL

2.1 A field survey and observation were carried out during 1978-1988 of the two case studies.

The LALRC organization was established in 1978, with initially 71 farmers who farm in the pilot area. The major functions of cooperative had been actively promoted with credit marketing and training services. The financial support in operating these activities was funded by members' shares and loans from Thai Farmer Bank. 5 years after implementation, the bank ceased lending because corruption was found among the cooperative committee. This strongly affected the cooperative which became vulnerable in operation and finally collapsed in 1988 with 322 farmer members. The ineffective performance was been perceived by members in views of a financial loss (see Fig.2-1) and a decline in services in terms of quantity, price, quality and delivery, which resulted in a drop in the service offered (see Fig.2-3) and a lack of trust in the financial management (see Fig.2-5). This

loss of faith among the members in the ability of the cooperative to bring prosperity resulted in the farmers returning to their dependence on middleman. This behavior could have effected a drop in repayment to the cooperative which may have accelerated the cooperative bankruptcy as the cooperative was unable to meet bank repayments.

On the other hand, observations of the BALRC organization has shown successful implementation. Initially, there were 176 members in 1982. The major functions of the cooperative are also credit and marketing services. Financial supports come from either the Thai Farmers Bank or the Land Reform Revolving Fund of the Agricultural Land Reform Office. The significant feature promoting the progress of this cooperative, is an increase in profit each year without corruption. This has resulted in an increase in members every year with a corresponding growth in confidence in the cooperative concept. In 1988, the cooperative comprised of 388 members, 98% of whom expressed believe in the honesty and reliability of the committee to financially manage the cooperative. This is certainly responsible for the high degree of cooperation among the members in service use and loan repayment which in turn feeds back into the cooperative profit.

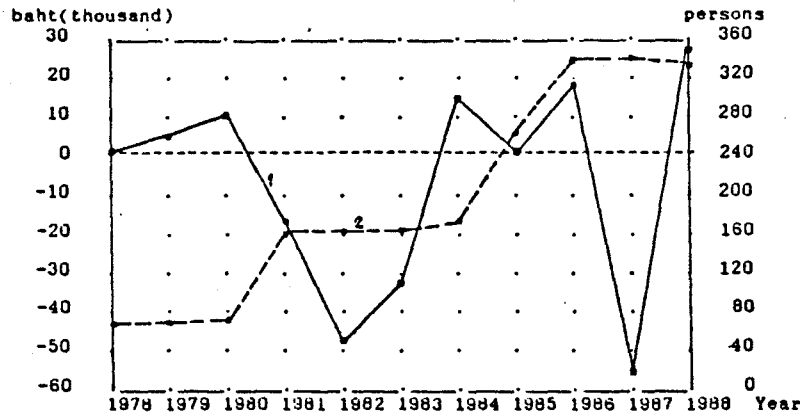
## 2.2 Concepts from innovation diffusion literature.

A government attempt to encourage rural people to be responsible for their own economic activities in group through cooperative organizations, can reflect the actions of a diffusion agency in local areas, since the organization settings do not immediately appear all over a rural area. Some groups in some areas have immediate access to the cooperative idea, some gain access later and some never do depending on the incentives and impulses to induce cooperative establishment. This pattern of spatial diffusion can be viewed as a primary diffusion level. The second level can be viewed as the process by which individuals gain membership and participation within an agency. The major contents of this study will focus and deal with the diffusion process within the organization as it effects the cooperative implementation.

## 2.3 Concepts from system dynamics simulation model approach.

Previous analysis of cooperative problems were often concerned with static behavior which explained only the correlation among a group of variables without explicitly understanding the real cause and effect relationships in the problems. A system dynamics method of analysis is applied in this study, since it can provide a wider explanation and a deep understanding of the system which exhibits dynamic and feedback interactions of variables through time as well as a contributing to policy analysis.

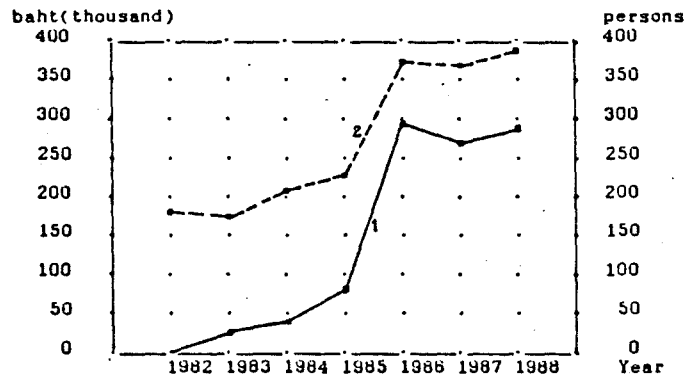
Figure 2-1. Distribution of Members and Annual Net Profit LALRC Ltd., during 1978 - 1988



Source : Annual Audit Report of Cooperative, Cooperative Office, Ayudthaya Province, Thailand, 1988

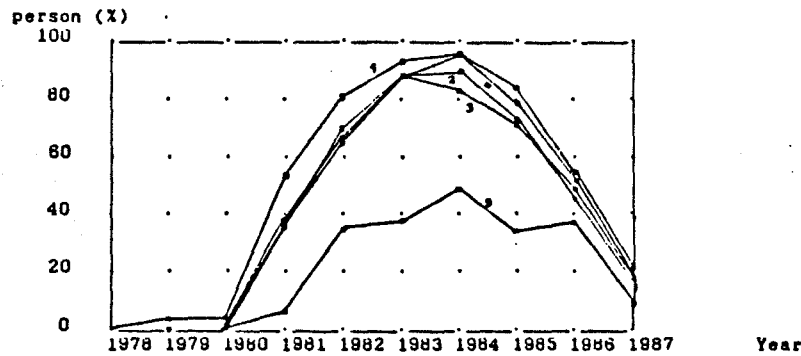
Remarks : 1. Net profit 2. Members

Figure 2-2. Distribution of Members and Annual Net Profit BALRC Ltd., during 1982 - 1988



Source : Cooperative Office, Banglana, Nakornpathom Province, Thailand, 1988.

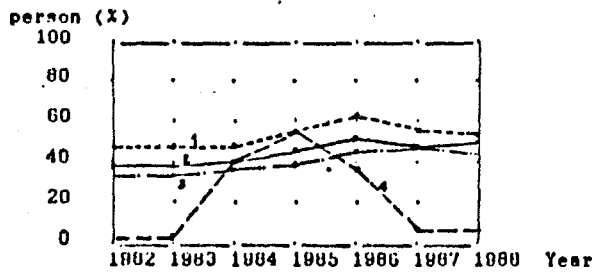
Figure 2-3. Distribution of Members in Service Uses Classified by Service Types of LALRC Ltd., During 1978 - 1987



Source : Data Collection from Field Survey in Ayudthaya Province, Thailand, 1985 - 1987

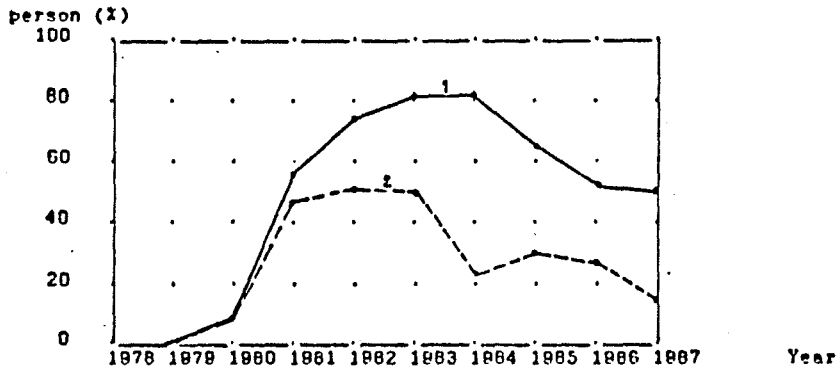
Remarks: 1. Fertilizer Use 2. Pesticide Use  
3. Insecticide Use 4. Marketing Use  
5. Training Use

Figure 2-4. Distribution of Members in Service Uses Classified by Service Types of BALRC Ltd., During 1982 - 1988



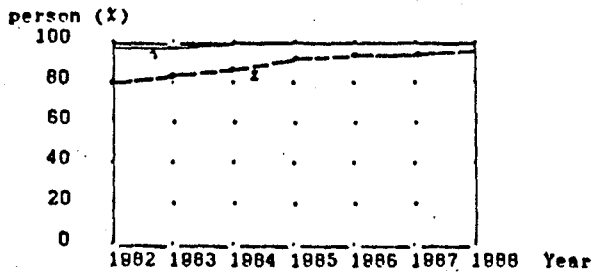
Source : Data Collection from Field Survey in Nakornpathom Province, Thailand, 1988  
 Remarks: 1. Fertilizer Use                      2. Pesticide Use  
 3. Insecticide Use                              4. Marketing Use

Figure 2-5. Distribution of Members' Attitudes Towards Financial Management of LALRC Ltd. During 1978-1987



Source : Data Collection from Field Survey in Ayudthaya Province, Thailand, 1985 - 1987  
 Remarks: 1. Total members presenting their attitudes  
 2. Members having trust the committee in financial management

Figure 2-6. Distribution of Members' Attitudes towards Financial Management of BALRC Ltd. During 1982-1988



Source : Data Collection from Field Survey in Nakornpathom Province, Thailand, 1988  
 Remarks: 1. Total members presenting their attitudes  
 2. Members having trust the committee in financial management

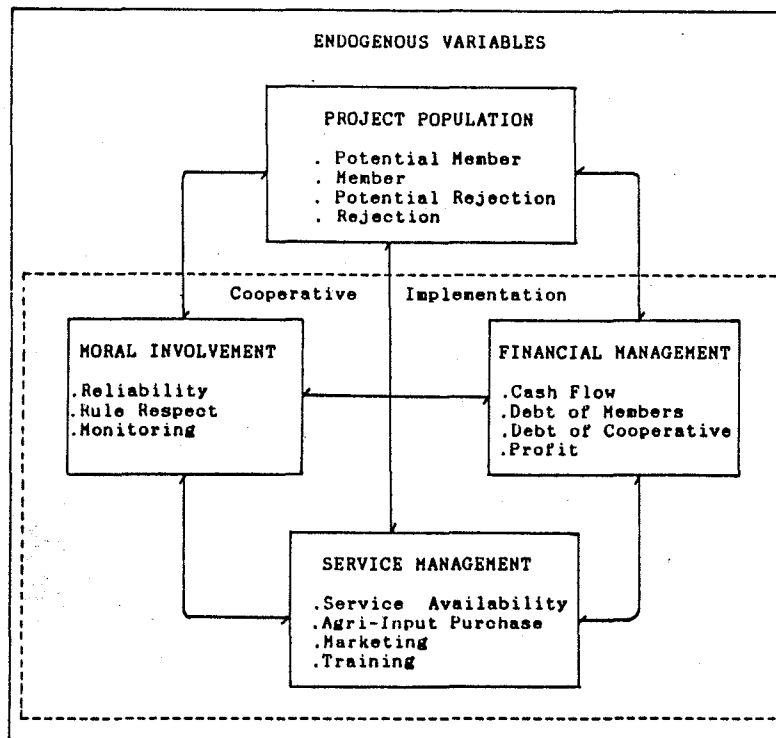
### 3. MODEL FRAMEWORK

#### 3.1 Dynamic Hypothesis

The success of an agricultural cooperative is affected by three main factors: cooperative services, cooperation among the cooperative members and moral involvement inherent in people's participation in cooperative activities. The cooperative services are measured by service accessibility to members; member satisfaction on business service management of agricultural inputs; marketing in terms of quantity, price, quality and delivery; satisfaction and the members' trust in the cooperative committee to handle financial management; and the amount of profit-sharing. Moral involvement is indicated by the reliability of the members involve themselves in cooperative work, their respect of regulations concerning activity participation and monitoring and acceptability for behavior improvement.

The dynamic interactions among these three main factors provide a negative feedback system. The growth of cooperative services will effect an increase in cooperative member cooperation. The greater the member cooperation cause less moral involvement which will effect a decrease in cooperative services.

#### 3.2 The Model Boundary



EXOGENOUS VARIABLES : Education Background of Members  
 : Government Intervention  
 : Land  
 : Production Factors  
 : Market Price of Production

Figure 3-1 : SYSTEM BOUNDARY OF COOPERATIVE STUDY

As shown in Figure 3-1, The agricultural cooperative system is composed of four subsystems: project population, financial management, service management and moral involvement.

Project population represents the cooperative diffusion patterns among four population groups namely: potential members, members, potential rejector/rejections, and rejector/rejections. Financial management explains the patterns of cooperative cash flow, member debts, cooperative debts and cooperative profits. Service management is realised as service availability which describes service use patterns in agricultural input, marketing and training within the cooperative organization. Moral involvement, including both ideas and actions, is indicated by member reliability to involve themselves in cooperative work, respect for the rules about active participation and monitoring accessibility and acceptibility for improvement.

The educational background of the members, government intervention, land, production factors and market price of production are put as exogenous variables of the system.

### 3.3 Feedback Structure

The population system, as shown in Fig.3-2, encompasses causal interrelationship among variables within the system. The population transfers among 4 groups, defined as potential members, members, potential rejections and rejections, are initiated and controlled by activity participation and reparticipation rates represented as policy variables to maintain the system balance.

The feedback loop of the cooperative implementation process illustrated in Fig.3-3, comprises the causal interaction between social behavior which are qualitative variables; such as moral involvement, service availability; and economic performance as quantitative variables; such as cash flow, profit and debt. Where measurements on a cardinal scale are not possible, variables are represented as indices that vary within a given range. Indicated moral involvement is effected by fractional members' trust in the cooperative committee to handle financial management. It is further modulated by their respect of regulations concerning activity participation, and ratio of improvement actions to identified mistakes found through the monitoring process. Indicated service availability is measured in terms of fractional members, which depend on middlemen and fractional members in service satisfaction effects. Cooperative cash flow is determined as total cash available in hand for management.

Figure 3-4 shows the feedback loop of the population system incorporated in the cooperative implementation system of the model in order to examine what effects the system changes, how policy parameters in economic domain: namely land productivity,

yield, price as well as social domain: namely reliability, rule respect, monitoring, dependency on middlemen and service satisfaction, effect the system over time. To determine which parameter is the most sensitive to the model and what policy variables should be taken to improve the ineffective performance.

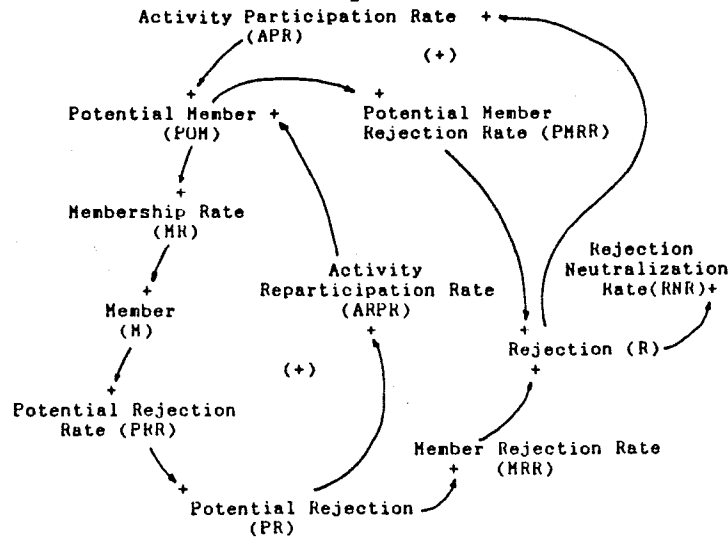


Figure 3-2: Feedback Relationships of Project Population based on Innovation Diffusion Theories

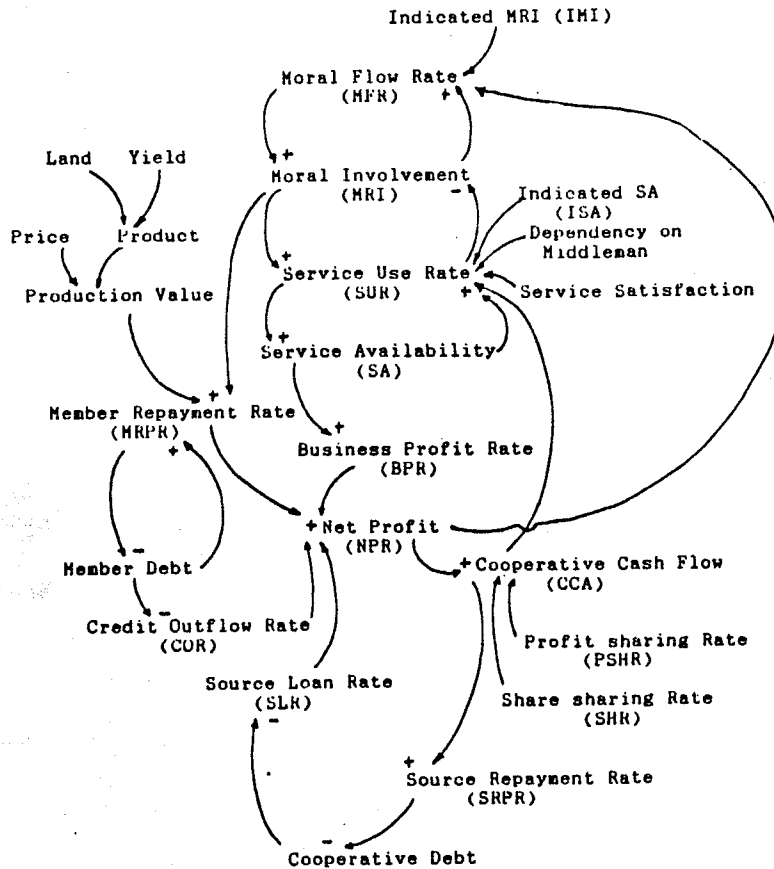


Figure 3-3 : Feedback Relationships of Cooperative Implementation



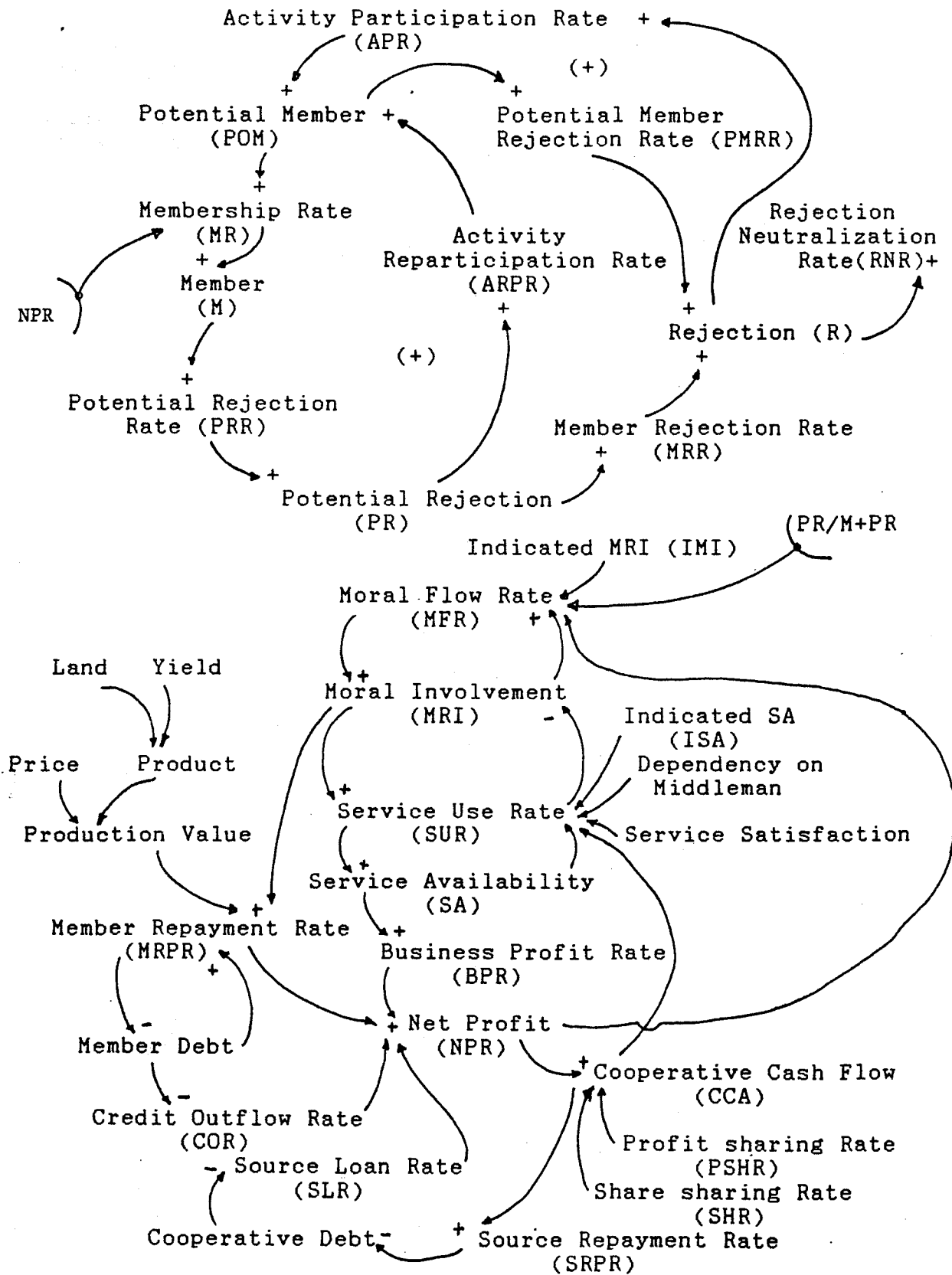


Figure 3-4 : Feedback Loops Incorporated into the Model

#### 4. MODEL STRUCTURE

The previous causal-loop diagrams are interpreted to explicitly define the types of variables in terms of levels and rates as well as significant parameters. The model has been developed with the Professional Dynamo Package. Technical details of the model are available on request.

#### 5. MODEL EXPERIMENT

##### 5.1 Population Diffusion Without Profit Incentive

###### (a) Discussion of Variables

Potential members are people who initially participate in defined activities and reparticipate in specific activities designed for better understanding among members after joining the cooperative for a certain time and feeling or performing against the cooperative concepts. The greater the activity participation and reparticipation rates, the greater the potential members. The fractional activity participation and reparticipation are valued of 0.8 and experimented as parameters affecting the two rates.

Members are ones coming from potential members by membership rate. When these people decide to be members, it usually means that they initially agree to adopt the cooperative principles. An increase in members usually result in less coordination. This could create potential rejections among members since they perceive the cooperative performance in negatively and tend to act against the group while retaining their membership status. The potential members varied by potential rejection rate are effected by the coefficient of potential rejection at a value of 0.1. The growth in members creates an increase in potential rejections who tend to become actual rejections. This possibly affects a collapse. To lessen the rejections, the activity reparticipation rate is addressed as a policy variable to control the system by motivating the potential rejection back to potential members for redecision making in performing as members or rejections. However, a larger proportion of rejections than other groups in the population system will affect a greater potential member rejection and activity participation rates.

###### (b) Experiment Results

The model has been simulated with an initial potential members (POM) of 100 people while the other groups start with 1 person. The POM has been accumulated by the activity participation rate from a target population of 200 people per month. The first experimentation, without interaction effect among subgroups, creates a system equilibrium when the activity participation rate and the membership rate come up to 160 and 103 people per month respectively. The membership rate experimented with the activity

reparticipation rate policy appears 29% higher than the one without policy. All the rate performance increase rapidly initially stage and then the rate of increase drops off until the system reaches equilibrium. (see Fig. 5-1, 5-2)

Secondly, the model is disturbed by the interaction effect among the subgroups. This is experimented in terms of table function expressing the effect of fractional rejection to the project population ( $POM+M+PR+R$ ) on the rates of potential member rejection and activity participation assuming that the greater the rejections, the greater the mentioned two rates. Similarly, the high ratio of potential rejection to project population will affect an increase in activity reparticipation rate. The membership rate declines rapidly at the outset and gradually increases to reach equilibrium. The system maintains a balance when the membership rate is 1 person per month and members accumulated at 79 people while potential rejections consist of 38 people. (see Fig. 5-3, 5-4)

## 5.2 Population Diffusion With Profit Incentive

Fig. 5-5 shows The population model, with initially 100 members, incorporating the financial management system in which a rise in positive net profit causes the membership rate to rapidly increase. Considering the system hypothesis, the membership rate also depends on the number of potential members changed by the activity participation rate which depends on the number of rejections. A decrease in rejections results in a drop of activity participation rate which will reduce the number of potential members. This relationship results in the membership rate sharply declining and gradually attaining equilibrium although net profit finally shoots up. Compared to the model behaviors in Fig. 5-6, simulated without considering the relationship between rejections and activity participation rate, the membership rate keeps rising due to a positive increase in net profit.

## 5.3 Collapsing Performance

A sign of collapse is a snowball effect of the service availability and the decline in moral involvement. The moral involvement is affected by the net profit and the ratio of potential rejections to the combination of members and potential rejections. A negative net profit and a higher fraction of potential rejections result in less moral involvement and a dramatic fall in the membership rate whether simulating with or without considering the relationship between rejections and activity participation rate. This means that a reduction in repayment rate, due to less moral involvement, will affect the net profit and in turn affect the moral involvement. Service availability depends on cash flow. Insufficient cash flow will cause a reduction in service use rate which will affect the profit from credit and marketing services and finally result in a

drop of net profit. (see Fig. 5-7, 5-8 )

Figure 5-1 Population Diffusion Without Activity Reparticipation Policy

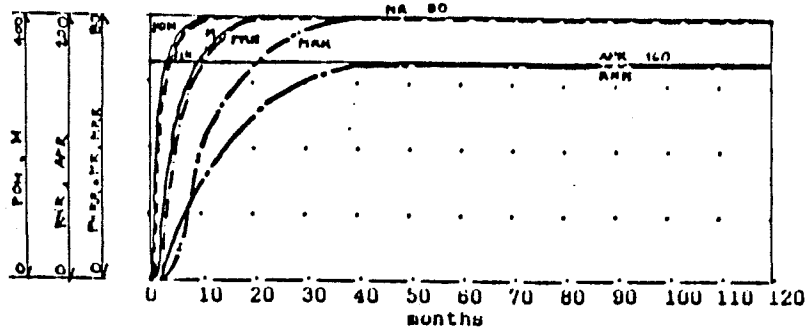


Figure 5-2 Population Diffusion in Fig 5-1 Incorporating Activity Reparticipation Policy

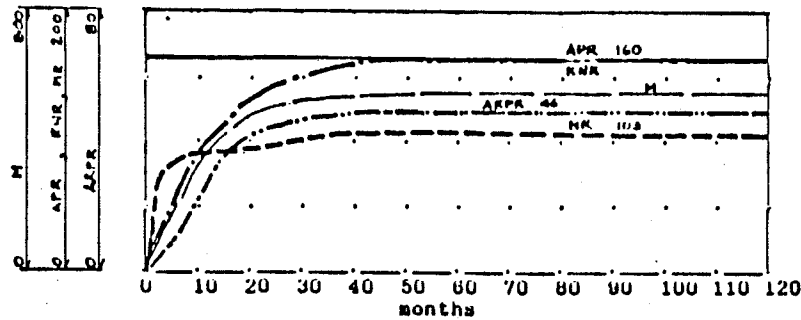
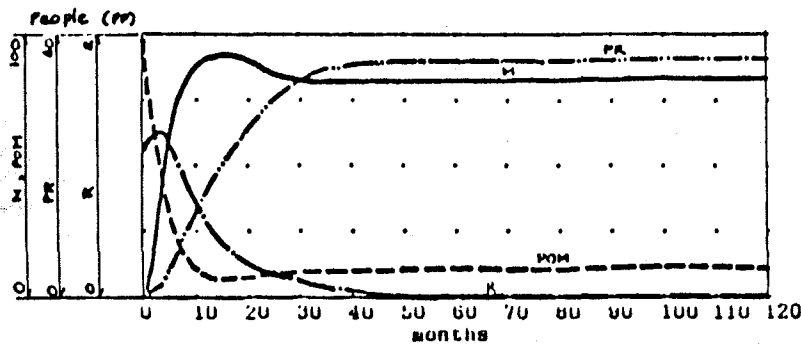
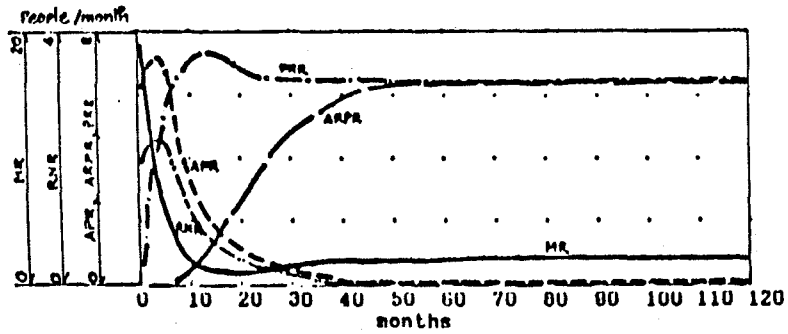


Figure 5-3 Population Diffusion in Fig.5-2 Incorporating Subgroup Interaction Presenting Level Performance



POM : Potential Member      APR: Activity Participation Rate  
 M : Member                      MR : Membership Rate  
 PR : Potential Rejection      PRR: Potential Rejection Rate  
 K : Rejection                    MRR: Member Rejection Rate  
     RNR: Rejection Neutralization Rate  
     PMRR: Potential Member Rejection Rate

Figure 5-4 Population Diffusion in Fig.5-2 Incorporating Subgroup Interaction Presenting Rate Performance



|                          |  |
|--------------------------|--|
| POH : Potential Member   | APR : Activity Participation Rate      |
| M : Member               | MR : Membership Rate                   |
| PR : Potential Rejection | PHRR : Potential Rejection Rate        |
| R : Rejection            | HRR : Member Rejection Rate            |
|                          | HNR : Rejection Neutralization Rate    |
|                          | PHNR : Potential Member Rejection Rate |

Figure 5-5 Population Diffusion in Fig.5-3 Incorporating Profit Incentive

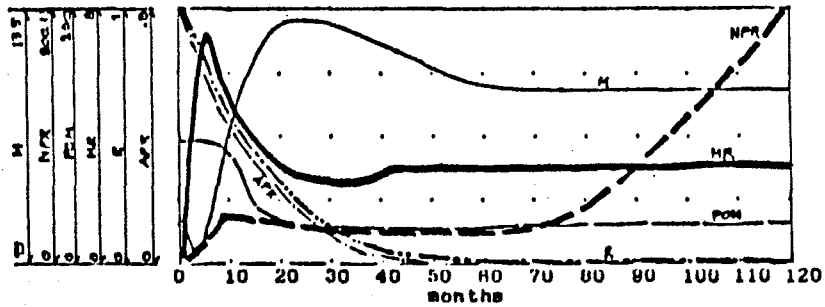
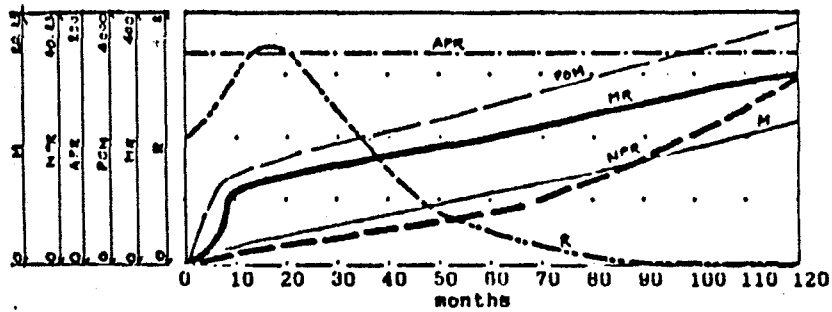


Figure 5-6 Population Diffusion in Fig. 5-5 Simulating Without The Relationship Between Rejections And Activity Participation Rate



|                          |                                   |
|--------------------------|-----------------------------------|
| POH : Potential Member   | APR : Activity Participation Rate |
| M : Member               | MR : Membership Rate              |
| PR : Potential Rejection | NPR : Net Profit                  |
| R : Rejection            | CCA : Cooperative Cash Flow       |

Figure 5-7 Population Diffusion in Fig. 5-5 incorporating Moral Involvement and Service Availability Performance

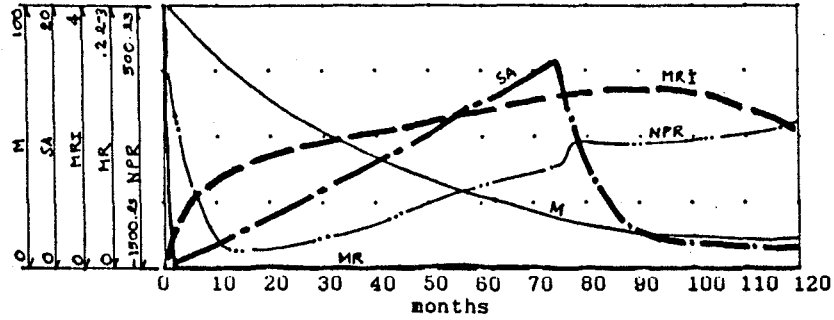
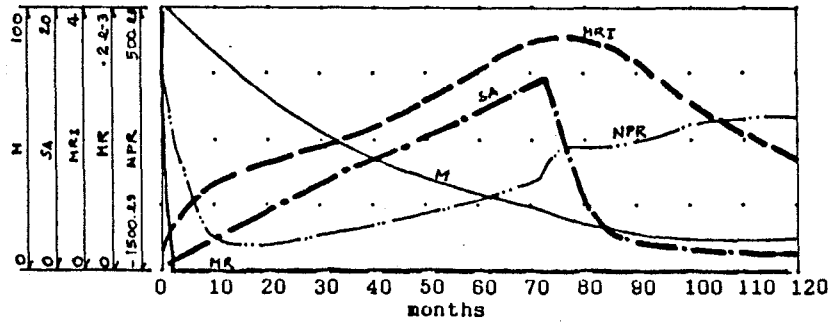


Figure 5-8 Population Diffusion in Fig. 5-6 incorporating Moral Involvement and Service Availability Performance



M : Member  
 PR : Potential Rejection  
 MR : Membership Rate  
 MRI : Moral Involvement  
 NPR : Net Profit  
 SUR : Service Use Rate  
 SA : Service Availability  
 MFR : Moral Involvement Rate

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