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**THE INFLUENCE OF
AGRICULTURAL CREDIT INSTITUTIONS
UPON AGRICULTURAL DEVELOPMENT**

by

Ted L. Jones

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FOREWORD

The Agricultural Finance Center of The Ohio State University, through a contract with The United States Agency for International Development, is conducting a world-wide research project on "An Analysis of Programs for the Development and Improvement of Agricultural Credit Institutions and Services." This project is designed to develop principles and guidelines useful to AID and developing countries in the establishment and operation of permanent and effective institutions and systems for providing agricultural credit in developing countries.

The influence of agricultural credit institutions upon agricultural development under different environmental conditions has plagued economists, economic planners, and other interested parties for many years. The complexity of the economic development process is only now being understood as bits and pieces of relevant information from many areas of the world are becoming more widely known. This Agricultural Finance Paper attempts to present a brief explanation of the relationship of agricultural development and emphasizes a realistic role of agricultural credit institutions in the agricultural development process.

The author is grateful for the published works of the many writers in the field of economic development that were used in the preparation of this paper. However, the major ideas presented in the latter half of the paper resulted from innumerable seminars with members of the Agricultural Finance Center staff. It is not feasible to recognize the contribution of all these individuals who have influenced the author's thinking on this subject, but special acknowledgement is given to Drs. R. A. Bailey and Norman Rask.

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**THE INFLUENCE OF AGRICULTURAL CREDIT INSTITUTIONS
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by

Ted L. Jones*

An understanding of the economic development process requires an approach similar to that followed by system analysts in solving problems. The importance of one factor cannot be understood except in terms of other closely related factors. Belshaw defined economic development as "----a continuing social process leading to a progressive increase in average output per head among the people in a society."^{1/} This definition refers to a process because economic development involves closely related variables and is continuous over time. Economic development is also concerned with the social sector because as the process continues, changes occur in the technical and institutional environments of society as well as in physical output.

Economists are compelled to focus their economic knowledge and training on current problem situations. Since World War II, the focus has been upon increasing the rate of economic development in the emerging nations and at least, maintaining the rate of economic development in the more mature countries. But the professional record as problem solvers, or even as explainers of the economic and social relationships involved in the economic development process, particularly in developing countries, is far from perfect.

In one sense, economists have felt restrained to offer their explanation of the development process by emphasizing the historical determinants of production--land, labor, capital, and management. Recently, technology has earned the right to be added to this august list. These determinants do place limitations on production, but they are not the determinants of economic development, per se. With a given amount of land, labor, capital, and technology, the manner in which people organize will determine the level of production.^{2/}

Too often in the past, economists have attempted to simplify the development process by calling attention to one limiting factor and then trying to remove this restraint as if it was not related to other variables. As a result, programs have been designed and conducted to solve the educational problem, production problem, marketing problem, capital problem, credit problem, or cooperative problem, etc. This approach has not been very fruitful.

* Associate Professor and Associate Director, Agricultural Finance Center, Department of Agricultural Economics and Rural Sociology, The Ohio State University. Presented at the NCR-6 Meeting, Sherman House, Chicago on November 2, 1967.

Probably the capital problem has received the greatest amount of attention. "In the view of many economists, capital occupies the central position in the theory of economic development."^{3/} Kindleberger quotes many economists who state that capital occupies the key role in the development process, but he also quotes as many who question the importance of capital as the key factor in development.^{4/} It is misleading to single out capital in light of available research and conclude that economic development is the result of only this one variable. Nevertheless, the importance of the role of capital in making possible higher production and higher income per person cannot be disregarded. It has been pointed out that differences in capital resources distinguishes the agriculture of developing countries from that of economically advanced countries more than any other factor.^{5/}

The Relationship of Agricultural Development to Economic Development

Agricultural development is one of the important sectors of the total economy that influences the over-all economic development process. Since the major quantities of the resource base of a country are in the agricultural sector during the early stages of economic development, agriculture's contribution or lack of contribution directly affects the over-all rate of development. Mellor reported that 60 to 80 per cent of the population is engaged in agriculture and 50 per cent or more of the national income is generated in the agricultural sector in the early stages of development in many countries.^{6/} Christensen pointed out that historical records clearly show that no country has moved from chronic stagnation into the take-off stage of economic development without first achieving a substantial gain in agricultural productivity.^{7/} Agriculture's contributions to national economic development have been subjected to analysis and recorded in excellent papers and books by many people.^{8/} There is general agreement that increased agricultural output comes from two basic sources--increased quantity of inputs and increased productivity resulting from improved technology. Christensen and Yee concluded that increases in agricultural productivity contribute to national economic development and national income in three major ways:

- 1) By supplying an economic surplus of agricultural production that can be consumed or used for further production either in the agricultural sector or in the non-agricultural sector.
- 2) By releasing labor and other resources for use in non-agricultural sectors, and
- 3) By increasing purchasing power of rural people, expanding markets for industrial development, and bringing about structural changes needed for national economic growth.^{9/}

Christensen made three general points that should be kept in mind when analyzing the process of economic development. These points were:

- 1) Investments must be made to improve technical skills and managerial talents of the human factors.
- 2) Agriculture must gradually shift from subsistence to market production, and
- 3) Scarce supplies of capital inputs from outside agriculture will need to be used sparingly and where marginal returns are largest in order to increase crop yields in the over-all productivity ratio in agriculture.^{10/}

Two of these three general points involve capital investments; one to improve the skills and talents of the human factor and two, to provide capital inputs from outside agriculture.

The Capital Formation Approach

Nurske presented one of the first applications of the capital formation explanation of growth in developing countries. In explaining the vicious circle of poverty he said, "There is small capacity to save resulting from low level of real income. The low real income is a reflection of low productivity which in its turn is due largely to the lack of capital. The lack of capital is the result of the small capacity to save."^{11/} Spitze stated that it was necessary to have a good understanding of the determinants of capital formation in order to understand the capital and credit problems in a changing agriculture.^{12/} The capital formation approach to economic development is widely held by many economists, but it certainly is not universal.^{13/} There is general agreement, however, that normally the productivity of labor will be increased when used with capital inputs and total production normally increases, other things being equal,

The conclusion was reached that capital formation problems are only one group of problems that need to be analyzed and solved to increase the rate of economic development. There is no intent to slight other problem areas, and there are many, but simply to state a position on one specific set of problems that need to be solved. Assuming then that capital problems are present, what are some of the questions that must be answered? Some of the more pressing problems are: What kinds of capital to add? When to add the additional capital? How much capital to add? Into what sectors and enterprises to inject capital? How to obtain the needed capital? How to inject the capital? The last point leads to the discussion of agricultural credit institutions as one means of injecting capital into agriculture and possibly thereby increasing the rate of agricultural development.

Objectives of Agricultural Credit Institutions

Since each country has its own unique combination of human agents, land, capital resources, and technical possibilities as well as its own economic, social, legal, and political institutions, agricultural credit institutions in these countries can have their own unique objectives. I submit, however, that the objectives of agricultural credit institutions should include the following points:

- 1) To increase the rate of economic development by facilitating the injection of capital into agriculture by:
 - A. Making, supervising, and collecting agricultural loans supplied to farm producers.
 - B. By making, supervising, and collecting agricultural loans supplied to agricultural marketing and supply firms, if not served by other lenders.
- 2) To up-grade the capabilities of the agricultural credit staff as well as providing for expansion of the number of trained agricultural credit personnel, and
- 3) To provide the lender services needed so the agricultural credit institution will be a viable and efficient institution over time.

One of the assignments concerning this paper was to support or refute the hypothesis that agricultural credit institutions are critical in determining the rate of agricultural development. The parameters of the expected role of agricultural credit institutions to agricultural development must be estimated before this hypothesis can be supported or refuted. Galbraith stated that in every agricultural community, developed or developing, farmers seek credit in order to acquire two broad types of capital assets. First, they seek credit in order to become owners of land or similar non-renewable assets. These assets are now in the possession of others. Here credit is required to facilitate the transfer of existing capital or existing productive equipment from one person to another. Second, farmers seek credit in order to bring into existence capital that does not now exist--capital such as better seeds, livestock, machinery, and so forth.^{14/} Belshaw raised the question concerning how fast could the developing countries absorb additional capital. In other words, what is the effective demand for additional increments of capital in agriculture? He also pointed out that even the capital that could be absorbed might not initiate and release forces for a cumulative process of economic development. The specific questions raised were: What amount of capital can be absorbed at each stage of development without unduly distorting the economy and diverting local capital away from necessary purposes? What amounts of capital and for what purposes are they best suited not simply to meet urgent needs,

but also to encourage participation of people and to provide a basis for further improvements? What other requirements are necessary besides capital imports and credit to initiate and encourage a cumulative process of growth and also increase absorptive capacity for imports of capital?^{15/} Belshaw concluded that the use of capital must provide foundations for better growth in at least three ways by:

- 1) Providing an economic base for additional economic activities.
- 2) Providing incentive goods of the right kind outside of farming so that increased capacity to produce and earn income is expressed in a larger effective demand and so is more stimulative to growth, and
- 3) Improving the human material so that it is more efficient and the social environment so that it is more receptive to change.

The procedures or techniques for providing these foundations in developing countries have not been developed, however, recent research efforts are shedding new light on many aspects of these old problems.^{16/}

I will take the position that many agricultural credit institutions in developing countries have been given the assignment of increasing the rate of agricultural development, but their terms of reference were too narrow for most of them to succeed. In other words, due to the apparent need for capital and in an attempt to meet the demands of a local populus, agricultural credit institutions were established and were expected to increase the rate of agricultural development in a very limited time. The credit institutions were often established with a minimum amount of information available concerning other limiting factors that could prevent the best organized and operated agricultural credit institutions from meeting their objectives.

Selected Experiences of Agricultural Credit Institutions

Several examples will be given to point out some of the different environmental situations under which agricultural credit institutions have operated in recent years.

Nigeria

Agricultural credit to individual farmers in the Eastern Region was made available through the Fund for Agricultural and Industrial Development (FAID). FAID was established in 1963 to provide a source of credit to individual farmers. In addition to loan funds the borrowers were to receive managerial and technical assistance at the farm level (supervised credit). In 1966, FAID had 350,000 Nigerian pounds available for disbursement from government funds. After 3 years of operation, 119 loans totaling 162,000 pounds, an average of 1400 pounds per loan, had been approved, but only 73 loans totaling 53,000 pounds had been disbursed. As of May 31, 1966, some additional 700 loans were under consideration. The application forms and procedures were exceedingly cumbersome and time consuming. Many loan applications were more than

one year old. All loans for agriculture were processed by the Supervised Agricultural Credit Section of the Ministry of Agriculture, which had a staff of 50 working exclusively on FAID agricultural loans.17/

Other reasons for the very limited impact of FAID upon agricultural production and development were as follows:

- 1) The preparation of complex farm plans that included an annual cash flow budget for the length of the loan. For example, if the loan was for rubber production with a term of 15 years, estimated costs and returns were projected for the 15 year period.
- 2) Regulations required the loans to be secured by the personal property of two guarantors in addition to the property of the borrower. It was very difficult and time consuming to obtain the two guarantors, which sometimes delayed the processing of the loan application for six to eight months.
- 3) Personnel in the credit institution did not have authority to change the loan forms to make them more workable as the legislation that created the lending institution specified the actual loan forms to be used.
- 4) Since farm plan and appraisal reports were prepared by the Supervised Credit Branch of the Ministry of Agriculture, the officials of FAID had no recourse but to wait until the applications were completed and forwarded to their offices, which often resulted in extensive delays.18/

Brazil

A supervised agricultural credit program was started on a state basis in 1949 under the sponsorship of the American International Association. The program was first started in the State of Minas Gerais and later spread to other states. Technical assistance in agricultural credit was supplied by the U. S. Government. In 1963, AID recruited a high level team to review the agricultural credit situation in Brazil. The team found that only 10 to 12 per cent of the farmers in Brazil had access to any agricultural credit and recommended that an Agricultural Credit Corporation be established. As a result, a credit institution named National Coordinating Agency for Rural Credit (CNCR) was established to make loans to small farmers.

AID then worked out a fertilizer loan whereby fertilizer could be imported and distributed. The United States provided the funds for this loan to buy and ship fertilizer into Brazil and the Brazilian importers paid in local currency. These funds were then used to support the new agricultural credit agency (CNCR). One-third of the total or approximately \$12,000,000 was used for agricultural credit.

In late 1964, the Banking Reform Act was enacted that created a Central Bank and placed the responsibility for agricultural credit in this institution. In November, 1965, a law was passed to institutionalize rural credit and a decree was issued to transfer CNCR to the Rural Credit and Industrial Division of the Central Bank. Also, five general categories of credit were established. These were:

- 1) Commercial credit.
- 2) Cooperative credit.
- 3) Supervised credit.
- 4) Agrarian reform credit.
- 5) Credit to support minimum prices of selected farm products.

Agricultural credit personnel and credit advisors are now working on the implementation of the various credit programs.

Technicians in the field believe that the new law gives Brazil the basic elements for a sound agricultural credit program. Since CNCR was established in July, 1964, approximately 50,000 farm loans have been made for a total of \$35,000,000.19/ But 17 years have passed since the supervised agricultural credit program was started and the institutional organization is still changing in an attempt to meet their objectives.

In addition, Brazil is experimenting with an unique approach to agricultural credit while trying to answer the question: what would be the rate of agricultural development if the capital limitation on farm firms was removed? This credit saturation project involves the extension of all the agricultural credit that can be used productively by selected farmers. Also, one of the objectives is the identification of limiting factors in agricultural development, when the capital limitation is removed. One of the interesting features to date was that the lenders, who were charged with the responsibility of providing or saturating the farms with capital, had a tendency to limit the loans to the amounts normally borrowed by the farmers. This limitation appears to have been corrected and plans are underway to extend the project in other areas.

Taiwan 20/

Taiwan's agriculture has developed considerably during the last few years. Chen and Bailey reported that in 1956 the agricultural domestic product was 2 billion 557 million NT and 12 billion 64 million NT in 1963. Agricultural credit from institutional sources as measured both by annual volume and by year in loans outstanding also increased during this period. Using least squares to fit regression lines to the data, the following relationships were found:

- 1) A ratio of nearly 1 to 1 (0.95) between increases in annual volume of agricultural credit and increases in net domestic agricultural product.

- 2) **A ratio of 3.2 between increases in agricultural credit as measured by the year end balances of outstanding loans and increases in net domestic agricultural products.**

Chen and Bailey emphasized that they did not intend to suggest a causal relationship. The only thing they were pointing out was that in Taiwan both agricultural production and agricultural credit volume had increased hand-in-hand from 1950 to 1963.

An analysis of the agricultural credit programs in Taiwan leads one to the conclusion that many factors have contributed to their success. These factors are summarized as follows:

- 1) **The agricultural credit system is based on organizations of long standing. Most of the Farmers Associations and Credit Departments have a history of more than 50 years of service in the rural areas. The credit operation is not new to the Farmers Association employees or to the farmers. As new agricultural credit programs were started, they had the advantage of not having to start from scratch, but could be added to existing organizations. Generally speaking, the political, economic, and social conditions have been reasonably stable since 1950. The national economy has been growing and farm produce markets have been stable with favorable agricultural prices. Credit needs for expansion and improvements have increased with the growth of the national economy. Also, a series of land reform programs were carried out to protect farmers interests after World War II.**

Due to a cultural background, and perhaps also due to general prosperity in agriculture, default on loans is extremely rare in Taiwan. Borrowers always seem to somehow repay their loans. Farmers that meet difficulties in repayment when there are floods, have to delay payment until the next harvest, but there is no information on loan delinquency in agricultural credit in Taiwan.

- 2) **The credit organizations are accessible to the farmers. The majority of the farmers live within ten to thirteen minutes of a Farmers Association Office.**
- 3) **The Farmers Associations, which actually handle the farm credit businesses, are cooperative organizations. Since the associations are autonomous organizations, their legal owners are their farmer-members. The operational structures are also advantageous to the successful development of the credit business. When the farmers market their produce through, and when they purchase farming and living materials from the Farmers Association Marketing and Purchasing Departments, financial support is provided from the Credit Department. When a farmer needs funds to adopt new farming techniques or to start a new farm enterprise, financial support is also provided by the Credit Department. Technical assistance is often given by the Extension Department as well as Marketing and Purchasing Departments.**

Although the agricultural credit program in Taiwan has a record of successful achievements, it still faces problems. Some of the problems are as follows:

- 1) The regular credit institutions, notably the Land Bank, the Cooperative Bank, and the Farmers Associations depend largely on deposits as a source of lending funds. Consequently, these institutions are not always in a position to provide loans when needed or in the amounts or for the periods of time required by farmers. Even if provision is made by the government for adequate funds, coordination of agricultural credit institutions is urgently needed. In the credit programs of the agricultural banks, there is a great deal of competition and duplication that obstructs the efficient use of loan funds. Under these conditions it is possible that farmers in the more prosperous agricultural areas may over-borrow while those on the less productive land in more remote areas may have little access to institutional credit.
- 2) It is often mentioned that agriculture in a developing country is capital hungry. This is the case in Taiwan if one is talking about capital per farm worker or per farm, but it is not the case if one is talking about capital per unit of land. If capital is measured on a per hectare of farm land basis, Taiwan's agriculture is equipped with more capital than American agriculture. Still, capital per farm worker is low and needs to be increased if development is to continue at a satisfactory rate. Chen and Bailey reported that the possibility of increasing the capital per farm worker is remote through the reduction in the number of farm workers. Therefore, an increase must occur in capital investment.

South Vietnam 21/

A system of agricultural credit was established in 1957 to provide low interest loans to farmers in close collaboration with various national programs of land reform, community development, propagation of agricultural techniques and the expansion of the cooperative movement.

The policy of the agricultural credit system was closely integrated with the general economic policy of the country with the following objectives:

- 1) Development of the rural economy, aiming mainly at the development of agriculture.
- 2) Effective and actual improvements of the standards of living of small farmers.
- 3) Liberation of the small farmer from moneylenders and from the attraction of the economic system proposed by the communists.

The agricultural credit system is engaged in a program that requires both short and long-run action. One of the most urgent needs is to provide help to the ex-sharecroppers that have recently been promoted to small land owners by the land reform program, but which at the same time find themselves totally deprived of the production capital previously provided by the large land owners. The problem is further complicated by the necessity of granting loans to the political refugees from North Vietnam that are settling in the new agricultural development centers.

Muc and Tiep emphasized that most of the short term production loans were based on the sense of dignity and responsibility of the borrower without any real guarantee or lien. They concluded, based upon the credit experiences from 1957 to 1963 that in the rural societies of Vietnam the ties that bind a society and regulate the actions of the individual are more moral than material or legal. The institution of credit can and must rely on moral guarantees that often are more binding than liens or mortgages. The attachment to the land, the respect of tradition, the honor of the family, the social constraints that spring from solidarity in ownership are factors with which the majority of the farmers concur, which reduces the risk of their non-payment of loans. The situation is one where the political and social organizations of the country substitute for land or real guarantees.

The National Office of Agricultural Credit (NACO) was created by presidential decree in 1957. The Central Office is located in Saigon with a regional organization in which a provincial committee for agricultural credit assumed the responsibility for loans.

Three different types of loans are made: (a) loans in cash, (b) loans in kind, and (c) loans in services.

Short-Term Loans

Duration:	six to eighteen months
Interest Rates:	twelve per cent per year
Object of the Loan:	annual production
Guarantee:	presentation by the borrower of an ownership title or by the recommendation of his local administrative committee on his reputation and capacity of repayment, together with the moral engagement of the borrower

Intermediate Term Loans

Duration:	eighteen months and five years
Interest Rates:	eight per cent per year
Object if the Loan:	purchase of cattle, equipment, and machinery, and plantation of orchards
Guarantee:	mortgage on real estate

Long-Term Loans

Duration:	five and fifteen years or more
Interest Rates:	six per cent per year
Object of the Loan:	allotment of a farm unit, purchase of land, the plantation of permanent cultures such as rubber, tea, tobacco, the erection of new facilities such as warehouses, processing plants, etc.
Guarantee:	real estate mortgage, the presentation of an operational plan and a proposal for repayment

Cooperative associations can only borrow money from NACO, which acts as a bank for cooperatives. It has been found advantageous to provide farm loans through these cooperative associations rather than direct to individual farmers. The loans granted through the cooperative associations increased from an average of 20 per cent of loan volume in 1957-58 to 32 per cent in 1964-65.

A program of supervised agricultural credit was established by NACO in 1963. Twenty pilot locations were selected with two or three farmers per location. Only a small number of supervised credit loans have been granted due to lack of security and instability caused by war, so it is not yet possible to evaluate this type of lender service in this environment.

The Role of Credit in Agricultural Development

The initial injection or expansion of agricultural credit as a source of capital does not always bring about an increase in agricultural production. Agricultural credit can be a powerful economic force for development if it is used to inject appropriate capital inputs into agriculture that are not otherwise available to farmers from their own financial, physical, and labor resources.^{22/} Mosher classifies production credit to farmers as an important accelerator of agricultural development. It is important to note that Mosher is talking about production credit as he emphasized that farmers must spend additional sums of money on improved seeds, fertilizers, and implements to increase production. Such expenditures must be financed either out of the savings of the farmers or by borrowing for the period between the date when supplies and equipment are purchased and the time when the agricultural products can be sold.^{23/}

A recent FAO publication pointed out that the incentives and the possibilities of using capital for increasing agricultural production are more limited in the early stages of rural development than is often realized. It is only at later stages of agricultural development that the productive element in agricultural credit generally increases. Although a rapid increase of long and medium term credit is essential for continued development of agriculture, this evolution depends to a great

extent on the conversion of the millions of small subsistence farm units into more advanced types of enterprises. The transformation from traditional agriculture to commercial agriculture depends on the existence of an adequate market for agricultural products. In other words, a need for agricultural credit and increased agricultural production must also be accompanied by an effective demand for the product at prices that are profitable for the farmer.^{24/} To summarize, agricultural credit is only one of the many factors playing a part in the complicated process of increasing agricultural production. Far from being a panacea, agricultural credit is not the harmless patent medicine that it is often thought to be.^{25/} Agricultural credit ceases to be an economic force facilitating agricultural development if it attempts to finance farmers either individually or collectively that do not have a potentially adequate economic base. If the individual farmer lacks sufficient financial, physical, or labor resources, within his family together with those supplied through the proceeds of a loan to increase his production and income so the loan can be repaid with interest and at the same time to improve his level of living, no economic purpose will be served by the granting of agricultural credit to this farmer. A loan on an uneconomic basis becomes a grant, and may destroy repayment discipline and contribute to the deterioration of the financial strength of the credit institutions.^{26/}

Many agricultural credit institutions and projects for increasing agricultural development have produced inadequate results or failed completely primarily because important economic, social, political, and cultural institutions were not sufficiently analyzed before the agricultural credit institution was created or re-organized. The tendency of viewing agricultural credit as an isolated subject has resulted in inadequate lender services that have produced inadequate returns to the resources employed.^{27/} Some governments of developing countries, advanced countries, and international agencies providing technical assistance have started credit programs without having first studied the other important institutional restraints and satisfied themselves that these projects had a reasonable chance of success. This report ^{28/} listed the following pre-conditions for the establishment of an efficient and effective agricultural credit institution:

- 1) The existence of adequate and efficient socio-economic planning and the desire of all parties and groups concerned to implement it.
- 2) An adequate rural infrastructure (roads, railroads, storage, and so forth).
- 3) An efficient system for stabilizing fluctuations in prices for agricultural produce.
- 4) A proper system of land tenure.
- 5) Adequate and effective arrangements for marketing and supply.
- 6) A well organized and satisfactorily operated agricultural extension service.

7) Continuity in governmental policies regarding agricultural credit and cooperative structures.

The listing and establishing of the major and minor pre-conditions did not imply that it was impossible to improve the agricultural credit structure if some of the pre-conditions were not met. It was recommended, however, that no project on agricultural credit be undertaken without a thorough investigation to determine to what extent the minimum prerequisites for its successful implementation are present. The research effort should indicate whether the pre-conditions can be implemented simultaneously with the credit project or whether the initial effort should be spent on developing or improving the pre-conditions before the agricultural credit institution is established.

Institutions Influencing Agricultural Credit Institutions

Agricultural credit institutions must be fitted to the economic, social, political, legal, and cultural institutions that prevail in the country if it is to facilitate agricultural development.

The supply of and demand for agricultural credit is, to a considerable degree, the result of the environmental setting within which the credit institution and the agricultural firms operate. When the environmental considerations are developed to the extent of favoring or inducing capital investment, effective programs of agricultural credit may be achieved. Conversely, deficiencies and maladjustments of the environmental considerations inhibit economic development and restrict effective investment in agriculture. Thereby making effective and continuing programs of agricultural credit difficult to achieve. Different types of agricultural credit systems have been operative with varied degrees of effectiveness under both favorable and less favorable environmental conditions. This poses such questions as:

- 1) What are the basic principles governing effective programs of agricultural credit in different environment settings?
- 2) What guidelines can be formulated for establishing and operating viable and effective agricultural credit institutions? and
- 3) Under what conditions, or environmental constraints, must these guidelines be modified?

Knowledge of and the relationship of the environmental components are necessary if agricultural credit and planning personnel can reasonably expect to organize and operate agricultural credit institutions in such a manner that agricultural producers can employ agricultural credit productively, benefit from its use, and increase the rate of agricultural development.^{29/} Economists need assistance from other disciplines to evaluate the non-agricultural institutions. If possible, an interdisciplinary effort of economists, anthropologists, political scientists, and sociologists could be very fruitful.

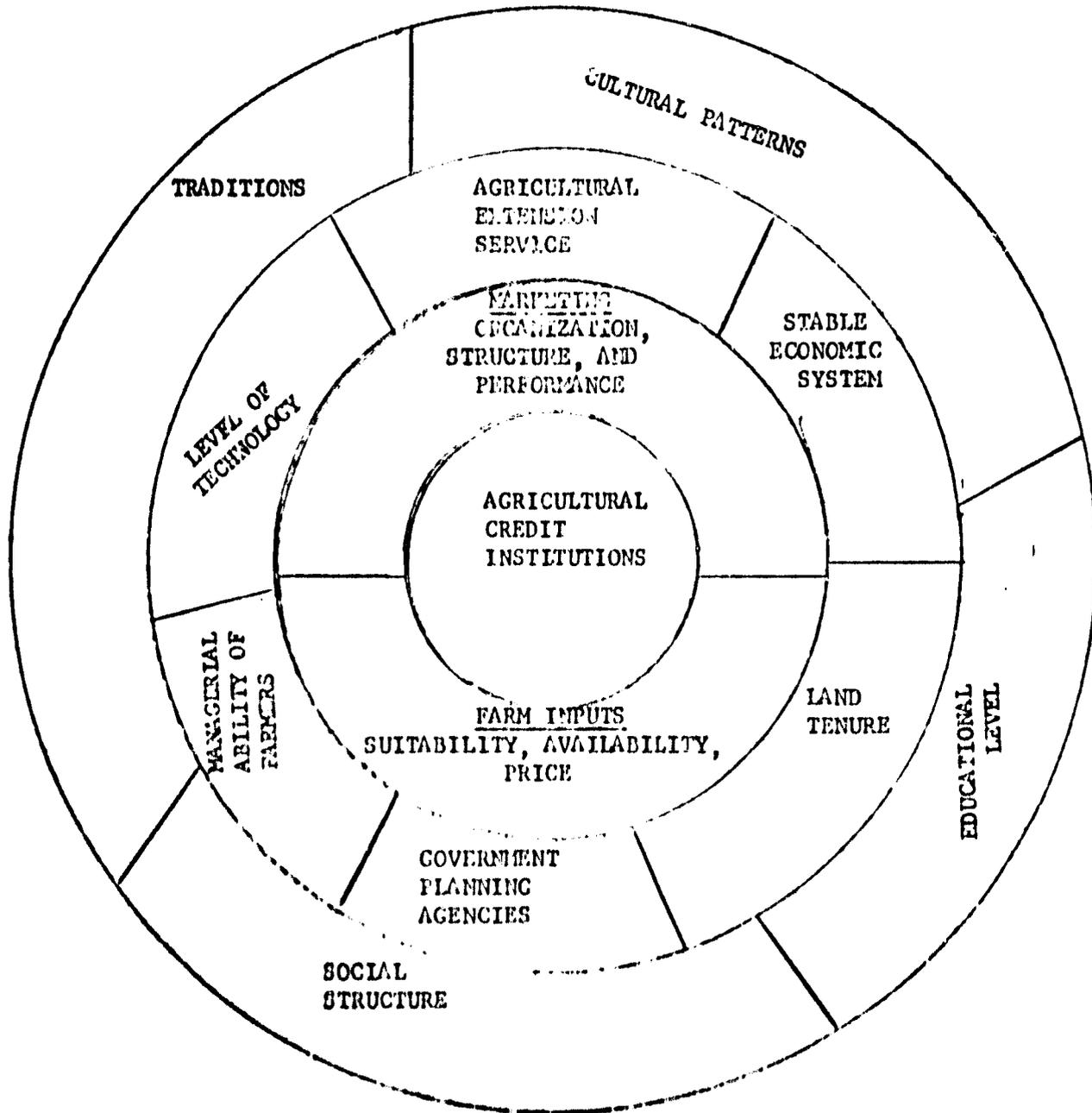
To be effective, agricultural credit institutions initially must fit into the present environment in the country when the agricultural credit institution is established. This is not to say the other environmental institutions are fixed in the long-run, but simply to recognize that in the short-run the environmental situation must be accepted as given. Some of the environmental institutions that influence agricultural credit are shown in Figure 1. It is conceptualized that agricultural credit institutions must operate initially in a given marketing organization, structure, and performance environment, and this environment can be determined from research efforts. Also, the suitability, availability, and price of off-farm inputs (capital) must be known in order to establish operating procedures of the agricultural credit institution that will work. It is conceptualized that the marketing and non-farm input institutions are influenced by the stability of the economic system, the land tenure system, governmental planning agencies, managerial ability of farmers, and level of technology used by farm operators. These institutions are influenced by the social structure, the educational level, cultural patterns, and traditions.

The objective of this paper is not to delve into detail on the influence of different political, economic, social, legal, and cultural institutions on the organization or operating procedures of agricultural credit institutions. However, selected examples will be presented before a suggested research methodology is presented for fitting the credit institution into the existing environment. One example concerning the affect of the land tenure system upon the type of agricultural credit institution is as follows: if the primary agricultural producer is a part of an extended family and is farming tribal owned land or if the farm producer is a small farmer who is either renting farm land from large farmers or working as hired labor on larger farms, then the credit institution that requires farm land as security for loans will be unable to operate in this environment. If on the other hand, the agricultural producers are free holders and hold title to the land, even though the acreage or size of unit may be small, real estate may be taken as security for a loan. This is not to imply that agricultural credit cannot be injected into environmental settings where the individual producers do not own their land. It does imply that the major type of loan that can be made will be for seeds, fertilizers, and other annual operating expenses that can be repaid from the sale of the crop at harvest time.

The types of loans must reflect the basic kinds of agricultural production in the area. In many countries, the basic types of agricultural production will vary from region to region thus requiring different types of loans and operating procedures for different areas within the same country. If the major types of crops in a region are annual grain crops, the major loan may be self-liquidating loans used for annual operating expenses. In this situation, if the market is adequate, the farmer is expected to be able to repay the loan from the proceeds of the sale of the farm products. If, on the other hand, the annual crops are primarily domestic food crops with a very limited market and the major income producing crops are tree crops such as cocoa and rubber, then the agricultural credit institution will need to be able to make loans for 4 or 5 years before income can be earned and the loan repaid from the tree crop investment.

FIGURE 1

INSTITUTIONS INFLUENCING AGRICULTURAL CREDIT INSTITUTIONS



The eligibility requirements could also limit prospective borrowers to those farmers with X number of acres of tree crops in production in order to obtain a long-term loan. Of course, there may be combination loans to producers that have both annual and tree crops that earn money income for loan repayment within the first year.

Suggested Research Methodology

The objective of analyzing the agricultural environmental setting is to determine the supply of agricultural credit currently being employed, if any, and the effective demand for agricultural credit. The farm producers may then be classified on the basis of present repayment ability. After the farm producers have been classified and the other environmental factors analyzed, it should be possible to develop the kinds of lender services needed to increase the rate of agricultural development.

Figure 2 shows one method of conceptualizing some of the environmental restraints with which an agricultural credit institution must deal if it is to be effective. In general, farm producers can be classified on the basis of the level of technology employed, using a power base as an indicator. The "low" designation would represent the power employed in agricultural production by the human agent using very simple tools such as the hoe and shovel. A limited amount of animal power could be in this sub-group but the vast majority of the power would be the human agent--the man with the hoe. The "medium" level of technology would include the groups of farmers that use animals as the major source of power in agricultural production, but complemented by human power. The farm machinery is improved over that used by the "low" level group, but it is still simple animal drawn equipment.

The "high" level of technology is when mechanical power either gasoline, oil, or electric is used in conjunction with animal and human power. The size in terms of horsepower of the mechanical tools may range from very small to large horsepower ratings.

The marketing organization, structure, and performance and the off-farm input supply environment are more difficult to conceptualize. The "poor" classification would be when marketing services do not exist or are very inadequate. Roads suitable for trucks or railroads do not exist (products are transported out of the production areas and inputs are brought into the areas by head loads or beast of burden). Non-farm inputs such as labor, machinery, fertilizer, seeds, insecticides, herbicides, improved livestock, building materials, and so forth are either not available, or of poor quality or are so highly priced that farm producers do not employ them in production. In terms of marketing, and off-farm input supply environment, this group represents traditional agricultural producers.

The "fair" classification could be typified as when a limited number of institutional marketing firms exist, but they are ineffective (limited number of buyers, limited storage, do not pay for commodities when delivered by producer, buyers maintain control over producer by keeping the producers perpetually in their debt, and so forth). Limited highways and railroads, but orderly movement to market on a regular basis is inadequate. The supply of off-farm inputs are incomplete, of poor quality or very high priced in terms of productivity.

FIGURE 2

LEVEL OF TECHNOLOGY USED BY FARM PRODUCERS

Marketing Organization, Structure, and Performance and Off-Farm Input Environments	<u>LOW</u> (Hoe-Agriculture)	<u>MEDIUM</u> (Animal Power)	<u>HIGH</u> (Mechanical Power)
Poor / Food Crops \ / Export \	A	B	C
Fair / Food Crops \ / Export \	D	E	F
Good / Food Crops \ / Export \	G	H	I

The "good" marketing organization and input supply environment is when institutional marketing services are well developed and effective. Good roads, railroads, or other transportation systems are well developed and commodities can move to market on a regular basis. The supply of off-farm inputs is adequate, of good quality, and reasonably priced in terms of productivity.

The conceptualization of areas A, B, C, and so forth as shown on Figure 2 visualizes that effective and efficient lender services will not be the same in all areas. Before the determination of the types of lender services required to increase agricultural development in any of the areas, additional information is required.

It is assumed that sub-section E or any of the other sub-sections could be delineated, additional research efforts in the form of surveys of farm operations would be required to obtain the types of information as shown in Figure 3. During the analysis, farm producers may be classified in several different ways. One method of classification could be to determine the characteristics of the farmers that are in the agricultural credit feasibility area at the present time. Subsistence farmers by definition are not in the money economy. Therefore, these farmers do not have repayment ability and are outside of the credit feasibility area.

Partially subsistence farmers are defined as those farm producers still predominately subsistence, but they do earn some money income from the sale of agricultural products. With the present farm organization and level of income, it would be possible for this group of farmers to repay small annual operating loans.

Commercial agriculture is defined as farm producers that generate farm income from the sale of agricultural products from their presently organized farms and have repayment capacity for both short and long-term loans.

Estimate of Effective Demand for Agricultural Credit

The classification of farmers into whether or not they are in the credit feasibility area is based on ability to pay from farm income. It should be recognized that ability to pay and willingness to pay agricultural debts are two entirely different concepts. An estimate of the willingness of agricultural producers to repay agricultural loans must be derived from the analysis of the social, cultural, and traditions of the society.

Connolly ^{30/} has developed a conceptual macro-agricultural economic model for the purpose of identifying the feasibility area within which agricultural credit can best be used to accelerate capital formation and agricultural development. The simplified model of the agricultural sector within a country is represented graphically with the following assumptions for the static model:

- 1) Constant price level.
- 2) Consumption as a linear function.

FIGURE 3

**ADDITIONAL INFORMATION REQUIRED FOR ESTABLISHING AND OPERATING
AN AGRICULTURAL CREDIT INSTITUTION**

<p>Classification of farmers to determine credit feasibility group</p> <ol style="list-style-type: none">1. Subsistence2. Partially subsistence3. Commercial <p>Effective demand for agricultural credit</p> <ol style="list-style-type: none">1. Farm size, type, estimate of managerial ability2. Productivity of capital <p>Present supply of capital (credit) in agriculture</p> <ol style="list-style-type: none">1. Sources, terms, interest rates, etc.2. Quantity and kind <p>Lender services required to increase rate of agricultural development</p>

- 3) Net foreign and government investments are consolidated into consumption and investment.
- 4) Savings equal investment. All forces are in equilibrium.

Basically, Connolly has added the food consumption function to the basic Keynesian model (Figure 4). By adding the food consumption function to the basic model, the agricultural credit feasibility group conceptually are those with income levels greater than Y_3 .^{31/} The triangle area F, E_3 , G graphically represents repayment ability, which is a function of the income level. Income equal to Y_1 is sufficient to meet food expenditures labeled E_1 (Figure 4). An income level less than Y_1 does not provide sufficient income for food expenditures. Human agents would be expected to fill the food gap, represented by triangle O, E_1 , a_1 , by hunting, stealing, borrowing, and so forth. The income level between Y_1 and Y_3 would provide sufficient income for food expenditures, but insufficient income for desired consumption expenditures for other goods and services. An income level of less than Y_3 represents no pay back ability from the present organization and income of the farms.

If supervised agricultural credit is used in the developing country, then the lower limit parameter E_3 Y_3 may be moved to the left as represented by line E_2 Y_2 in Figure 5. Parameters E_3 Y_3 and E_2 Y_2 now delineate the upper and lower limits of the feasible supervised agricultural credit group. Supervised agricultural credit could be used for an income level greater than Y_3 , but the need for supervised credit in this area is not as great.^{32/}

After the agricultural credit feasibility group is conceptualized the magnitude or size of the group must be determined by obtaining a measurement of the size of the agricultural credit feasibility area. It is then possible to derive an estimate of the number of farm units that can use capital injection with pay back ability with the present organization and income from the farm firms.^{33/}

Another method of estimating the effective demand for agricultural credit is by estimating the marginal productivity of capital. Chen used the Cobb-Douglas production function to estimate the marginal productivity for both fixed capital assets and working capital assets in several different areas in Taiwan.^{34/} The results of these estimates were then compared with the existing lending policies of the credit institution. For example, if the lending institution is making loans for particular assets that have lower marginal productivities estimates than other lending alternatives, it would serve as a signal to delve deeper into the returns earned by the assets.

The budgeting procedure using input-output data from the farm data could also be used to estimate the types of assets that should be financed and to determine the priority of different types of productive assets.

FIGURE 4

CONCEPTUALIZATION OF FOOD AND OTHER CONSUMPTION EXPENDITURES
AND AGRICULTURAL CREDIT FEASIBILITY GROUPS

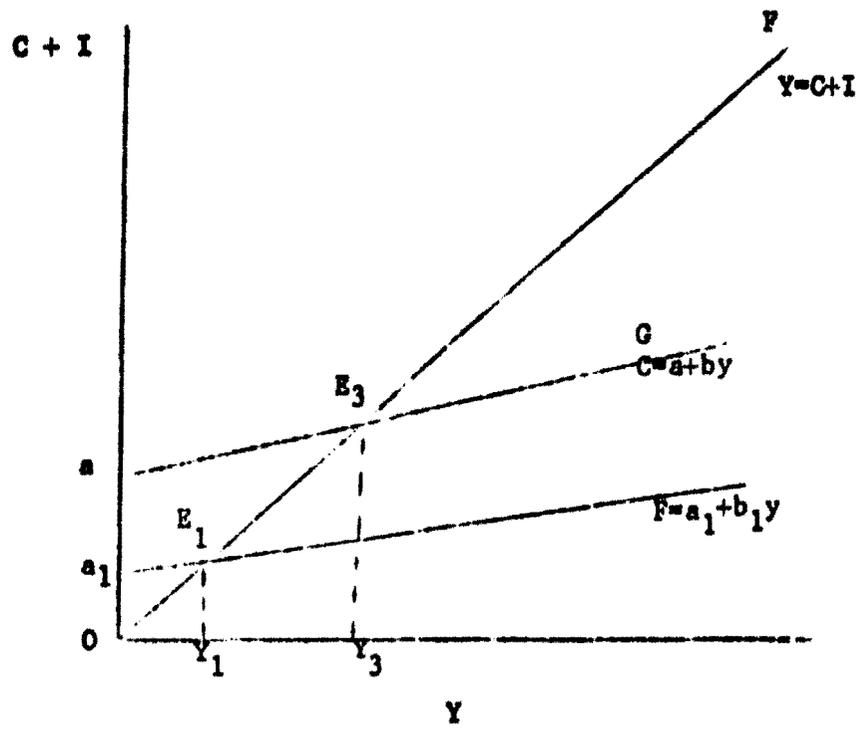
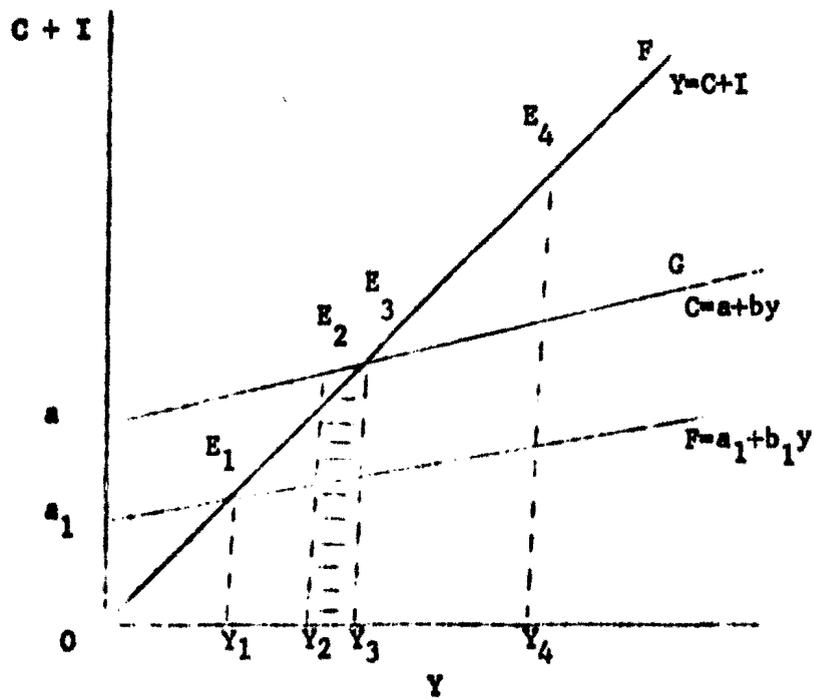


FIGURE 5

CONCEPTUALIZATION OF AGRICULTURAL CREDIT
FEASIBILITY GROUPS, BY LEVEL OF INCOME



Supply of Agricultural Credit

The farm survey of individual operators would also reveal the quantity of agricultural credit used in production as well as the source, terms, interest rate, and security required by existing lenders. In many developing countries, the only institutional agricultural credit that is available is from governmental owned or sponsored credit institutions. But in most developing countries, moneylenders provide the largest quantities of agricultural credit. If the effective demand for agricultural credit can be estimated for the farmers with repayment ability and the supply of agricultural credit being used in the area can also be estimated, it is then possible to determine the magnitude of the financing requirement in terms of loan funds for increasing the rate of agricultural development.

Type of Agricultural Lender Services Needed in Developing Countries

The ultimate objective of analyzing the environmental situation in depth is to determine the kind of agricultural lender services needed to increase the rate of agricultural development. The analysis could also indicate that at the present stage of economic growth a greater return would be expected from developing institutions other than credit; for example, improving the marketing system, improving the input supply system, etc.

The types of agricultural credit services needed in developing countries are conceptualized as follows:

- 1) **Supervised credit.** The supervised credit system organized in many developing countries is similar to the Farmers Home Administration in the United States. In one sense, all agricultural loans involve some degree of supervision, but supervised credit is normally defined as the making of agricultural loans (often credit in kind for operating expenses) plus the financial and farm management or technical assistance at the farm level. Supervised credit normally involves the preparation of an annual farm plan and in many cases, a long range farm plan for the duration of the longest loan involved. Financial management assistance is given in the analysis of balance sheets and income statements if they are available. If not the borrowers are strongly urged to maintain such records for future guidance in farm planning and increased agricultural credit usage. The technical assistance feature of the supervised credit package of lender services increases the cost of operating the agricultural credit institution, but increases the probability of loan repayment and increased production by the supplying of supervision at the farm level. The technical assistance portion of the lender services is an educational item that must be paid from sources outside of the credit institution by service fees, or charging a rate of interest sufficient to cover the total costs. Due to the limited number of individual farmers that an agricultural credit specialist can service in many developing countries because of the limited means of transportation, educational level of the farmer, and other factors,

the supervised credit institution should not be expected to completely cover their total costs from interest income. However, burden is upon the agricultural credit personnel to keep supervision and technical assistance costs at as low a level as possible without sacrificing the services required in order to increase the rate of agricultural development.

Battles 35/ suggested that the relatively simple types of farming operations in developing countries may require less detailed farm plans than, for example, some of the complex farming operations existing in the United States. The farm plans could be more general and less detailed, thus it would require less time of the technical assistance staff for each farmer and reduce the cost of his assistance.

- 2) Balanced credit (where both repayment ability and security of the farm borrowers are used in the credit analysis).

The term balanced credit defines the situation where loan funds or credit in kind are made to individual farmers along with financial management assistance, but without technical assistance or intensive supervision at the farm level. Normally, the agricultural credit specialist will not prepare a farm plan. He will assist in the analysis and projection of balance sheets and income statements to estimate the impact of the credit used by the farmer. Balanced credit would be primarily for those groups of farmers that have some farm assets that can be used for part of the security with the remainder of the security being based on the estimated repayment ability of the farmer, after agricultural capital is injected. The agricultural credit specialist should be able to serve more farm operators with this type of lending service than if he has to provide supervision at the farm level.

- 3) Commercial agricultural credit. Commercial agricultural credit is conceptualized as loan funds being provided to individual operators without technical assistance or supervision at the farm level and with only limited financial management. The loans will be based primarily upon the security offered by the borrowers. Normally, only large plantations or estates will be eligible for this type of lender service in developing countries.

The cost of the agricultural credit lender services would be greatest for the supervised credit and progressively less for balanced and commercial agricultural credit. After analyzing the farm producers and the environment in which they operate, the major task is to determine the kind or kinds of agricultural lender services that will make the greatest contribution to agricultural development, based upon the available resources of the agricultural credit institution.

Need for Agricultural Credit Training Programs

Any discussion concerning the influence of agricultural credit institutions upon agricultural development would be incomplete if the need for well trained agricultural credit personnel was omitted. The

shortage of well trained agricultural credit personnel is one of the greatest restraints that precludes the establishment of efficient and effective agricultural credit institutions. The form of business organization of the agricultural credit institution may be private corporations, cooperatives, governmental corporations or any other form, the environment may be analyzed perfectly, and the operating procedures for providing the lender services needed may be more than adequate, but unless the agricultural credit personnel are sufficiently trained in making, supervising, and collecting loans, the agricultural credit institutions will not succeed or survive over time. The development of an adequately trained credit staff is essential if a faster rate of economic development is expected.

The level and status of training of agricultural credit personnel varies widely among developing countries. Most developing countries have some type of in-service training programs in various stages of development. Many of these in-service training programs are just being developed with assigned host country training personnel that do not have the necessary background or training to conduct a well organized integrated program on a continuous basis. Some countries send a limited number of agricultural credit specialists to other countries for credit training.^{36/} If the major emphasis on training of agricultural credit specialists is dependent upon training in other countries, then it is evident that many credit workers will not receive adequate training due to budgetary, time, and language limitations.

Several developing countries have USAID direct hire, PASA or other non-direct hire personnel in country that assist with agricultural credit training programs. These agricultural credit technicians have many other responsibilities in addition to developing and conducting agricultural credit training programs so the need for expanded credit training programs remains unfulfilled.

One method of filling the training gap would be to organize a highly trained cadre of experienced personnel to go into developing countries to train the "trainers" of the host country. A cadre of three or four individuals could assist in organizing the training program, in training the trainers, and in conducting a pilot training program within a three to four month period. The major advantage of this program would be that 30-60 credit specialists within one institution would receive training at one time. The agricultural lender services required for agricultural development would be emphasized and tested within the environment in which capital would be injected.

Conclusion

The functions of agricultural credit institutions are limited to: (1) mobilizing loan funds from the economy (not always possible in developing nations in the early stages of development), (2) supplying the loan funds needed to purchase productive assets (capital) for agriculture that otherwise could not be obtained by farmers, and (3) furnishing or coordinating technical assistance, if needed, at the farm level in the form of financial and managerial assistance.

Agricultural credit institutions can accelerate agricultural development provided the economic, social, political, and legal institution in the economy have been correctly analyzed and the agricultural lender services needed in the environment are provided. After the environment has been analyzed and lender services determined, the major tasks facing the individuals responsible for the credit institution are to organize or reorganize the credit institution, to develop operating procedures, and to staff the institution with the best available personnel.

The above generalizations are the results of appraising the throes of typical credit institutions in developing countries. Too often, the agricultural credit institutions that were established in developing countries were only transplanted from more advanced countries. Too often, the basic organization and operating procedures that had evolved over many years in more productive environments were expected to work, as is, in the developing countries. The actual result was an injection of credit (and capital) into the agricultural sector, with only limited amounts, if any, of increased agricultural production moving into commercial marketing channels, and the income level of the farm borrowers was not increased. The repayment record was often very poor. It was only a matter of time until the capital and loan funds were dissipated without accelerating development. The agricultural credit institution was either dissolved or reorganized with another injection of capital from government, a new set of operating procedures, and with many, if not all, of the same credit personnel remaining in the organization at the same level of training.

Agricultural credit technicians and consultants have spent too much of their limited time drafting credit legislation, preparing detailed operating procedures, and emphasizing low interest loans. It was not recognized that the real limitations that prevented agricultural credit institutions from being an effective instrument of development was that it did not fit into the environmental structure and the level of training of the credit staff was insufficient to make, collect, and supervise agricultural loans. (This conclusion assumes that in the early stages of development the loan funds for agriculture will come primarily from government. If the loan funds are inadequate, the best organized and operated agricultural credit institutions will only have a limited impact upon development).

The methodology suggested herein is one approach to fitting agricultural credit institutions into a given environment with the expectation that the time required to determine the optimum lender services will be reduced and the limited supply of loan funds and trained human agents will be more efficiently utilized in the development process.

FOOTNOTES

- 1/** Horace Belshaw, Agricultural Credit in Economically Underdeveloped Countries, (Rome: FAO Publication, 1959), page 5.
- 2/** Lyle W. Shannon, "Cultural and Related Restraints and Means of Overcoming Them," Paper presented at the Conference on the Economic Development of Agriculture, Ames, Iowa, November 9-12, 1964, page 1.
- 3/** Charles P. Kindleberger, Economic Development, (New York: McGraw-Hill Book Company, 1958), page 83.
- 4/** Ibid.
- 5/** Dwight Gadsby, "Capital and Credit," Chapter 7, Changes in Agriculture in 26 Developing Nations, 1948 to 1963, U. S. Department of Agriculture, Foreign Agricultural Economics Report No. 27, November 1965, page 77. Also, Peter T. Bauer and Basil S. Yamey, The Economics of Underdeveloped Countries, The University of Chicago Press, 1957, page 113.
- 6/** John W. Mellor, The Economics of Agricultural Development, (Ithaca, New York: Cornell University Press, 1966), pp. 3-17.
- 7/** Raymond P. Christensen, "Economic Progress of Agriculture in the Less Developed Countries," paper presented before the Conference on the Economic Development of Agriculture, Center for Agricultural and Economic Development, Iowa State University, November 11, 1964.
- 8/** The authors and publications are expanding rapidly as our profession directs its attention more and more to the developing nations. For example, Agriculture in Economic Development, Edited by Carl K. Eicher and Lawrence W. Witt (New York: McGraw Hill series in International Development, 1964) provides many interesting articles plus a good bibliography on the contribution of agriculture to economic development.
- 9/** Raymond P. Christensen and Harold T. Yee, "The Role of Agricultural Productivity in Economic Development," Journal of Farm Economics, Vol. 46, No. 5, December 1964, pp. 1051-1052.
- 10/** Jimmie S. Hillman, "Discussion: Growth Rates and Economic Development," Journal of Farm Economics, Vol. 46, No. 5, December 1964, p. 1064.
- 11/** Ragnar Nurkse, Problems of Capital Formation in Underdeveloped Countries, Oxford University Press, Zair Laven, New Jersey, 1963, page 5.
- 12/** R. G. F. Spitze, Chapter 2, "Determinants of Capital Formation-- Conceptual and Factual Considerations," Capital and Credit Needs in a Changing Agriculture, edited by E. L. Baum, H. G. Diezulin, and E. O. Heady, The Iowa State University Press, Ames, Iowa, U.S.A., page 19. He defined capital as produced goods and services saved from consumption. (Maintenance and direct satisfaction of man) and used by, or as a part of, the human agent in further production.

- 13/** Many writers believe that the role of capital has been over-emphasized in explaining the economic development process. These include Lauchlin Currie, Accelerating Development, McGraw-Hill Book Company, New York, 1966; Gottfried Haberler, Stability and Progress in the World Economy, The Macmillan Company, New York, 1958; Charles Kindleberger, Economic Development, McGraw-Hill Book Company, New York, 1958; Everett Hagen, On the Theory of Social Change, Dorsey Press, Homewood, Illinois, 1962; J. K. Galbraith, The Liberal Hour, Houghton Mifflin Company, Boston, 1960; Albert Hirschman, The Strategy of Economic Development, Yale University Press, New Haven, Connecticut, 1958; and others.
- 14/** John K. Galbraith, "The Supply of Capital For Underdeveloped Areas," proceedings of the International Conference on Agricultural and Cooperative Credit, Vol. I, edited by Elizabeth K. Bauer, Berkeley, California, August 4 to October 2, 1952.
- 15/** Horace Belshaw, Ibid. "Capital Needs and Capital Absorption," pp. 133-134.
- 16/** For example, The Agricultural Finance Center, The Ohio State University is just completing a three-year research effort financed by The Agency for International Development entitled, "An Analysis of Programs for the Development and Improvement of Agricultural Credit Institutions and Services." The primary objectives were: (1) to develop guidelines for the establishment and operation of permanent and effective institutions and systems for providing agricultural credit in developing countries, and (2) to develop guidelines for technical and economic assistance programs in agricultural credit.
- 17/** Ted L. Jones, A. R. Gans, Robert C. Hoover, Richard P. Maxey, A. H. Stoneham, and Mervin G. Smith, A Proposed Agricultural Credit Program for Nigeria, Consortium for the Study of Nigerian Rural Development. (The report was prepared by the Agricultural Finance Center of The Ohio State University under a sub-contract from CSNRD.) Michigan State University, East Lansing, Michigan, CSNRD-4, August 1966, pp. 28-29.
- 18/** For a description of Nigerian agricultural credit institutions, see, A Situation Report on Agricultural Credit in Nigeria, by Harold Bauman, Chan Connolly and John Whitney, Consortium for the Study of Nigerian Rural Development, Report-3 (prepared by the Agricultural Finance Center, The Ohio State University under a sub-contract from CSNRD). Michigan State University, East Lansing, Michigan, June 1966.
- 19/** Ralph U. Battles, unpublished report of the U.S. Agricultural Credit Technicians in Latin America, Guatemala City, August 8-10, 1966, pp. 3-6.
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- 23/ A. T. Mosher, Getting Agriculture Moving, Frederick A. Praeger Publishers, New York, October 1965, page 141.
- 24/ Agricultural Credit Through Cooperatives and Other Institutions, FAO Agricultural Studies No. 68, Rome, 1965, pp. 1-2.
- 25/ Ibid., page 3.
- 26/ Battles, Op. Cit., page 1.
- 27/ Agricultural Credit Through Cooperatives and Other Institutions, Op. Cit., pp. 9-10.
- 28/ Ibid., page 9.
- 29/ C. D. Curry, D. M. Sorensen, J. O. Early, and D. L. Stansbury, "Some Environmental Considerations Influencing Agricultural Credit in Developing Countries," an agricultural finance paper (mimeographed), Agricultural Finance Center, Department of Agricultural Economics and Rural Sociology, The Ohio State University, May 1967, page 1.
- 30/ Chancy C. Connolly, (unpublished paper), "Identifying and Measuring the Agricultural Credit Feasibility Area for Capital Injection in a Country With a Probability Measure for Credit Repayment," Agricultural Finance Center, Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio, March, 1966.
- 31/ Food expenditures = $a_1 + b_1 y$ with F = food consumption; a_1 = level of food consumption; b_1 = propensity to consume food, and y = farm income.
- 32/ Connolly, Op. Cit., pp. 7-9.
- 33/ Connolly, Ibid., pp. 9-13. A sample of farm balance sheets and income statements could provide the data to classify the farm firms according to volume of farm income. A frequency distribution of farm income can be derived. Next the probability of farm income being greater than or equal to consumption can be computed for the different levels of income. From these data, it is possible to estimate the probability of loan repayments for specific borrowers.

34/ For additional information concerning the use of the Cobb-Douglas production function, see G. Tintner and O. H. Brownlee, "Production Functions Derived from Farm Records," Journal of Farm Economics, Vol. 16 (1944), pp. 295-304; Earl C. Heady, "Production Functions from a Random Sample of Farms," Journal of Farm Economics, Vol. 28 (1946), page 991; John R. Hilderbrand, "Some Difficulties With Empirical Results from Whole-Farm Cobb-Douglas Type Production Functions," Journal of Farm Economics, Vol. 42 (1960); George G. Judge, "Discussion: Estimate of the Aggregate Agricultural Production Functions from Cross Sectional Data," Journal of Farm Economics, Vol. 44 (1962); and Hsing-Yiu Chen (unpublished Ph.D. Thesis) "Structure and Productivity of Capital in the Agriculture of Taiwan and Their Policy Implications to Agricultural Finance," The Ohio State University, Columbus, 1967.

35/ Battles, Op. Cit., page 5.

36/ Agricultural credit specialists from developing countries have received training in agricultural credit in the United States for many years. A new training program to broaden the subject matter training received by foreign participants was initiated in the Fall of 1966 at The Agricultural Finance Center, The Ohio State University. This International Agricultural Credit Training Program is financed by the Agency for International Development. For more information concerning the fourteen-week International Agricultural Credit Training Program, contact the Agricultural Finance Center, The Ohio State University, Columbus, Ohio.

