INFORMATION TO USERS

The most advanced technology has been used to photograph and reproduce this manuscript from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book. These are also available as one exposure on a standard 35mm slide or as a 17" x 23" black and white photographic print for an additional charge.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.
Comparative analysis of agricultural extension models and development of recommendations for the agricultural extension system of Burma

Maung, Mya, Ph.D.

The Ohio State University, 1989
COMPARATIVE ANALYSIS OF AGRICULTURAL EXTENSION MODELS
AND DEVELOPMENT OF RECOMMENDATIONS
FOR THE AGRICULTURAL EXTENSION SYSTEM OF BURMA

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Mya Maung, B.Ag., M.Sc.

* * * *

The Ohio State University
1989

Dissertation Committee:
Larry Miller
John Rohrer
William Flinn

Approved By
Larry E. Miller
Adviser
Department of Agricultural Education
ACKNOWLEDGEMENTS

I would like to express my sincere thanks to Dr. Larry E. Miller, my adviser, who has been most helpful in guiding my academic study program, and for giving me his time and valuable suggestions. My appreciation and gratitude are also given to the other members of my advisory committee, Drs. John D. Rohrer and William L. Flinn, for their suggestions and comments. My gratefulness is also extended to the Burmese authorities Managing Director, the Agriculture Corporation, Ministry of Agriculture and Forests for allowing me to study in the U.S.; and to the United States Agency for International Development (USAID) for their financial assistance. Special thanks also goes to Dennis Weller, AID, Washington, D.C. and Professor Burton E. Swanson, from the University of Illinois for providing me with valuable information related to this study.

Special gratitude and appreciation is expressed to the staff members of the Midwest Universities Consortium for International Activities, Inc. (MUCIA), especially to Dr. William L. Flinn the Executive Director of MUCIA and Ms. Linda Curtin, Secretary of MUCIA. I am deeply indebted to Dr. Flinn for his special support to all Burmese trainees, not only in the academic area, but also in his
moral, social, and financial support that help make us successful. Ms. Linda Curtin is gratefully acknowledged for her patient typing of hundreds of pages throughout this study. She is the best. I would also like to express my deep appreciation to Mr. John Bielefeldt for all of his assistance with the editing of this dissertation and also Dr. Charles Simpkins for all of his support.

Last, but not least, I am very thankful to my wife, Daw Si Si and my children, Mar Mar; Swe Swe; and Aung Aung. We have been apart from each other for a long time; but their encouragement has been the strongest sustaining force through these years.
VITA

October 18, 1944 ................................................. Born - Twin Gyi Village, M yaung Township, Burma

1965 ................................................................. B.Ag., Institute of Agriculture, Mandalay, Burma

1965-1966 ............................................................. Junior Research Officer, Agricultural Research Institute, Department of Agriculture, Rangoon, Burma

1966-1967 ............................................................. Assistant Executive Officer (Extension), Agriculture and Rural Development Corporation, Bassein, Burma

1967-1972 ............................................................. Executive Officer (Extension) Agriculture and Rural Development Corporation, Bassein & Henzada, Burma

1972-1973 ............................................................. Deputy Assistant General Manager, Agriculture Corporation, Rangoon, Burma

1975 ................................................................. M.Sc. (App Ento); Imperial College of Science and Technology, University of London, London, England

1976-1980 ............................................................. Head of Entomology Department, Agricultural Research Institute, Agriculture Corporation, Yezin, Burma
VITA (Cont'd)

1980–1982 ................................................................. Divisional Extension Manager, Pegu Division, Agriculture Corporation – Assigned to supervise agricultural extension activities in 28 townships, Burma.

1982–1986 ................................................................. Project Director, Maize and Oilseeds Production Project, USAID. Agriculture Corporation, Rangoon, Burma.

FIELDS OF STUDY

Major Field: Agricultural Education

Studies in: Extension Education, Rural Sociology, and Research
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS .................................................. ii
VITA ........................................................................ iv
LIST OF TABLES ............................................................ viii
LIST OF FIGURES ........................................................... x

CHAPTER

I. INTRODUCTION ......................................................... 1

Need for Agricultural Development Worldwide ................ 1
Role of Agricultural Extension
  in Agricultural Development ...................................... 14
Research Problems and Objectives ................................ 17
Definition of Terms .................................................... 18
Limitations ................................................................. 21
Basic Assumptions .................................................... 21

II. REVIEW OF LITERATURE ........................................... 23

Development of Agricultural Extension ......................... 26
Different Categories of Agricultural Extension ................. 32
Main Approaches (Models) of Agricultural
  Extension .................................................................. 38
Main Criteria Used in Assessing Extension
  Systems .................................................................... 42

III. RESEARCH METHODS ............................................... 49

Criteria to Be Used in Analyzing the Burmese
  Extension System and Three Extension Models ............ 50
Analysis ................................................................. 55
## LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (a) Average Yields for Maize 1981-1984</td>
<td>7</td>
</tr>
<tr>
<td>(b) Average Yields for Unhulled Paddy Rice 1981-1984</td>
<td>8</td>
</tr>
<tr>
<td>(c) Average Yields for Potatoes 1982-1984</td>
<td>9</td>
</tr>
<tr>
<td>(d) Average Yields for Wheat 1981-1984</td>
<td>10</td>
</tr>
<tr>
<td>2. Peasant Families and Size of Holdings in 1985-86</td>
<td>59</td>
</tr>
<tr>
<td>3. Proportion of Gross Domestic Products by Sector.</td>
<td>64</td>
</tr>
<tr>
<td>4. Crop Yields in 1986</td>
<td>66</td>
</tr>
<tr>
<td>5. Fertilizer Use per Cropped Hectare in 1985</td>
<td>67</td>
</tr>
<tr>
<td>6. Government and Free Market Prices (ks) of Some Agricultural Products</td>
<td>69</td>
</tr>
<tr>
<td>7. Staff for Divisions of the Agricultural Corporation.</td>
<td>77</td>
</tr>
<tr>
<td>8. Agricultural Educational Institutions in Burma</td>
<td>82</td>
</tr>
<tr>
<td>9. Percentage Allocation of Public Capital Expenditures</td>
<td>86</td>
</tr>
<tr>
<td>10. Recurrent Expenditures</td>
<td>88</td>
</tr>
<tr>
<td>11. Recurrent Expenditures for Agricultural Extension.</td>
<td>89</td>
</tr>
<tr>
<td>12. Growth of Gross Domestic Product</td>
<td>90</td>
</tr>
<tr>
<td>13. Average Annual Growth Rate of Crop Farming</td>
<td>90</td>
</tr>
<tr>
<td>14. Recurrent Expenditures for Fiscal Year 1988</td>
<td>91</td>
</tr>
<tr>
<td>TABLE</td>
<td>PAGE</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>15. Extension Personnel by Function and Program Area</td>
<td>92</td>
</tr>
<tr>
<td>16. Educational Qualification of Field Extension Personnel</td>
<td>93</td>
</tr>
<tr>
<td>17. Extension Activities of Burmese Extension Service</td>
<td>96</td>
</tr>
<tr>
<td>18. Individual Extension Activities in Burma</td>
<td>97</td>
</tr>
<tr>
<td>19. Export and Government Price of Paddy in Burma</td>
<td>101</td>
</tr>
<tr>
<td>20. Requirement and Availability of Total Fertilizer in Burma</td>
<td>102</td>
</tr>
<tr>
<td>21. Agricultural Land in Burma and Japan</td>
<td>103</td>
</tr>
<tr>
<td>22. Yield of Important Crops in Burma and Japan</td>
<td>104</td>
</tr>
<tr>
<td>23. Frequency and Level of Contact Between Extension and Research</td>
<td>151</td>
</tr>
<tr>
<td>24. Annual Recurrent Expenditures of Extension Alone and the Whole USDA (U.S. Dollars in Millions)</td>
<td>153</td>
</tr>
<tr>
<td>25. State Extension Staffing by Level of Academic Degree (1978)</td>
<td>156</td>
</tr>
<tr>
<td>26. Large Increases in Agricultural Production with Little Change in Land Farmed in the U.S.</td>
<td>163</td>
</tr>
<tr>
<td>27. Extension Bulletins Produced by OCES in 1988</td>
<td>171</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organizational Chart of Burmese Agriculture Corporation</td>
<td>72</td>
</tr>
<tr>
<td>2. USDA Organizational Chart</td>
<td>123</td>
</tr>
<tr>
<td>3. USDA, Extension Service Organizational Chart</td>
<td>124</td>
</tr>
<tr>
<td>4. Ohio Cooperative Extension Service Organizational Chart</td>
<td>127</td>
</tr>
<tr>
<td>5. Extension Districts and Counties in the State of Ohio</td>
<td>128</td>
</tr>
<tr>
<td>6. The Five Basic Activities of On-Farm Research in Farming System Research and Extension</td>
<td>176</td>
</tr>
<tr>
<td>7. Organizational Pattern of the Training and Visit System</td>
<td>190</td>
</tr>
<tr>
<td>8. Six Interated Processes of Extension Program Development</td>
<td>214</td>
</tr>
<tr>
<td>9. A Model for Strategic Planning by McConkey</td>
<td>216</td>
</tr>
<tr>
<td>10. Concepts of Adult Teaching</td>
<td>230</td>
</tr>
<tr>
<td>11. A System of Technology Development and Transfer for Burma</td>
<td>232</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Introduction

The primary purpose of this study was to compare and contrast agricultural extension models recently used in the world. A secondary purpose was to develop recommendations to modify the existing Burmese agricultural extension system to bring about a rapid adoption of research-generated technology and production practices for increased production of crops.

Need for Agricultural Development Worldwide

The basic needs of people are food, clothes, and shelter. These needs are served by the agricultural sector and food production ranks first in terms of importance to people in the world. The majority of people in many less developed countries still draw their living from agriculture. Close to two-thirds of the developing world's population gains its livelihood from the land as farmers or farm workers. Most of these farmers comprise the poorest segment of the population (World Bank, 1983: 188-189). Improving the quality of life of these people, their communities, and ultimately the world community can only be achieved through agricultural development, which is in turn promoted by applying appropriate agricultural technologies through agricultural extension services.
Most countries in the world seek to increase food production to keep up with population growth, but such production has not kept pace with population in many less developed countries. Consequently, millions of people suffer from hunger and malnutrition.

According to demographers, the world population will be at least six billion by the year 2000. Without great improvements in food production, the gap between food supplies and population may widen (Prawl et al. 1984). According to La Rouche (1988),

"... the biggest problem in world agriculture was that, with a projected harvest of less than 1.5 billion tons of grain in 1988, the production was less than half the grain needed to feed the world's 5 billion people."

Tennenbaum (1988) indicated that food production could not keep up with demand. For example, total world milk production stagnated in 1987 and was decreasing in 1988. She added that world supplies of sugar were below demand in 1988 and that world cereal production has fallen dramatically. The world's largest cereal harvest, achieved in 1984, was 1.8 billion tons. In 1987, only 1.6 billion tons were harvested and in 1988 the expectation was 1.2 to 1.3 billion tons. In order to adequately feed five billion people, 3.4 to 3.6 billion tons of cereal production would be required (Tennenbaum 1988). These data indicated that there was an urgent need to increase the productivity of rural small farmers who comprised the largest portion of the poor
of the world. World poverty stems largely from the problems and constraints faced by these millions of small farmers and landless rural laborers. Coombs and Ahmed (1978:14) pointed out:

In most situations a forward thrust in agriculture was one of the essentials for initiating a broader rural development process. But a spurt in agriculture itself requires a combination of circumstances, one of which -- but only one -- being that farmers must learn and apply improved ways of farming.

Axinn and Thorat (1972) suggested that the scientific production of new germ plasm, such as high yielding varieties of rice and wheat developed at international research institutes, could "solve" the world food problem and should be the main thrust of future investment. Stevens and Jabara (1988) also acknowledged the role of the green revolution in meeting food problems in less developed countries. The development of fertilizer-responsive, high-yielding varieties of wheat, rice and maize has indeed alleviated economic and food problems in some less developed nations. These new varieties of crops accounted for much of the increase in food production in South Asia after 1967. When first introduced in traditional agricultural areas, high yielding varieties coupled with more fertilizers, often increased yields by 50 to 100 percent -- truly a green revolution for these farmers (Stevens and Jabara 1988:207).

Effective use of improved agricultural technology by farmers was the practical basis of this increase in production, and providing
farmers with the latest technology was the great challenge facing extension workers. Agricultural extension has a central role to play in any system for using new farm technologies. It was well documented for example, that the efforts of the cooperative extension service were vital to the development of the agricultural sector in the United States and the effective application of advanced agricultural technologies by farmers.

The United States Department of Agriculture (USDA) reported to the Congress in 1980 (cited in Prawl et al. 1984) that agricultural extension programs had contributed significantly to a growth in productivity and efficiency in U.S. agriculture by increasing the rate of adoption of new technologies and new knowledge generated by research. This, in turn, had contributed to the capacity of U.S. agriculture to increase exports while simultaneously satisfying the consumer demands for a wide range of food products at low cost. In 1982, each farmer in the United States produced enough food to feed 78 persons. Only about 17 percent of U.S. consumer's income was spent on food (Prawl et al.:1984). In addition to this abundant supply of farm products, agriculture contributed greatly to U.S. economic growth, including significant farm exports. For example, in the late 1970's, the U.S. accounted for 41 percent of world trade in wheat, 68 percent in coarse grains and 73 percent in soybeans (Penn, 1979).

The USDA (1980) (cited in Prawl et al. 1984) estimated that 40 percent of the Soviet Union's population and approximately 70 percent
of China's population were farmers. The significance of these figures in relation to productivity was apparent when they were contrasted with a U.S. farm population of 2%. The high level of productivity in American agriculture, sustained by such a small percentage of the population, was not an accident, but rather a result of making new technology and new knowledge available to farmers.

It was imperative to extend appropriate technology to farmers in less developed countries, where "traditional" agricultural methods have been in use. Stevens and Jabara (1988) defined traditional agricultural technology as "the art of agriculture, which has been passed on verbally and by demonstration from one generation to the next, based upon much observation and experience in local farming areas over the years." They reported that most of world agriculture was traditional until about 1850. Until 1950, most of the agriculture in Asia, Africa, and Latin America remained traditional.

Today, millions of farmers in low income nations have adopted some elements of more productive and science-based, agricultural technology. However, they still continue to use many traditional methods. Consequently, the average crop yields obtained in the traditional agricultural systems were very low compared to those in countries such as the U.S. or Japan. According to USDA (1984) statistics on crop yields in the early 1980's, comparative national data for four major world crops (maize, potatoes, rice and wheat) show
that average crop yields in less developed countries were generally about 25-50 per cent of those in more developed nations. (Table 1 (a-d).

Yields of traditional agricultural systems in less developed countries remained low, and showed very little change until the last two decades (Stevens & Jabara 1988). Land and other physical resource constraints may not be the major impediments to large increases in agricultural production; continuously increasing growth in agricultural productivity might instead be achieved by shifting from a resource based traditional agriculture to a science-based agriculture. Stevens and Jabara (1988) suggested that the best response to the food shortage in less developed countries was technology: it would be technically possible to increase agricultural production through wide-spread adoption of chemical fertilizers, improved crop varieties, better agricultural machinery, and proper irrigation.

Unfortunately, this new technology has not yet reached the majority of farmers in less developed countries. Acceptance and application of modern technology (innovations) by farmers in less developed countries such as Burma will be the major determinant to agricultural development. Norman (1980) pointed out that when farmers were slow to adopt a new technology, it was usually because there were inadequate price or production incentives, or because the technology itself was inappropriate. Mosher (1966) suggested that the factors essential for agricultural development are: 1) improved technology;
2) adequate markets; 3) available supplies and inputs; 4) access to adequate transport; and 5) sufficient incentives to motivate the farmers to innovate. Lagemann (1982) said that adoption of innovations by farmers depends on many factors, but that the following services must be available at the farm level if diffusion of innovations was to occur: 1) extension methods; 2) production and distribution of seeds and planting materials; 3) delivery systems of inputs required; 4) availability of credit; and 5) assurance of market outlets. The shift from traditional to science-based agricultural methods requires an appropriate extension service. Burma is one of the countries that desperately needs such an extension system.

Table 1
Average Yields for Maize 1981-1984, Selected Nations

<table>
<thead>
<tr>
<th>NATION</th>
<th>METRIC TONS PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>0.9</td>
</tr>
<tr>
<td>India</td>
<td>1.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>1.4</td>
</tr>
<tr>
<td>Brazil</td>
<td>1.7</td>
</tr>
<tr>
<td>U.S.S.R.</td>
<td>2.9</td>
</tr>
<tr>
<td>United States</td>
<td>6.4</td>
</tr>
<tr>
<td>Burma</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Source: USDA (1984)
Table 1 (continued)

Average Yields for Unhulled Paddy Rice 1981-1984, Selected Nations

<table>
<thead>
<tr>
<th>NATION</th>
<th>METRIC TONS PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1.5</td>
</tr>
<tr>
<td>India</td>
<td>2.0</td>
</tr>
<tr>
<td>Pakistan</td>
<td>2.6</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3.7</td>
</tr>
<tr>
<td>China</td>
<td>4.7</td>
</tr>
<tr>
<td>Japan</td>
<td>5.7</td>
</tr>
<tr>
<td>Egypt</td>
<td>5.7</td>
</tr>
<tr>
<td>United States</td>
<td>5.3</td>
</tr>
<tr>
<td>Burma</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Source: USDA (1984)
<table>
<thead>
<tr>
<th>Nation</th>
<th>Metric Tons per Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>7.1</td>
</tr>
<tr>
<td>Peru</td>
<td>8.2</td>
</tr>
<tr>
<td>USSR</td>
<td>12.0</td>
</tr>
<tr>
<td>China</td>
<td>12.5</td>
</tr>
<tr>
<td>Poland</td>
<td>15.9</td>
</tr>
<tr>
<td>Egypt</td>
<td>16.3</td>
</tr>
<tr>
<td>West Germany</td>
<td>28.8</td>
</tr>
<tr>
<td>United States</td>
<td>30.8</td>
</tr>
<tr>
<td>Burma</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Source: FAO (1984)
### Table 1 (continued)

**Average Yields for Wheat 1981-1984, Selected Nations**

<table>
<thead>
<tr>
<th>NATION</th>
<th>Metric Tons per Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>0.6</td>
</tr>
<tr>
<td>USSR</td>
<td>1.5</td>
</tr>
<tr>
<td>Turkey</td>
<td>1.6</td>
</tr>
<tr>
<td>India</td>
<td>1.7</td>
</tr>
<tr>
<td>Argentina</td>
<td>1.7</td>
</tr>
<tr>
<td>United States</td>
<td>2.4</td>
</tr>
<tr>
<td>China</td>
<td>2.5</td>
</tr>
<tr>
<td>Mexico</td>
<td>3.9</td>
</tr>
<tr>
<td>France</td>
<td>5.1</td>
</tr>
<tr>
<td>Burma</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Source: USDA (1984)

---

**Need for Agricultural Development in Burma**

Burma is one of the least developed countries in the world. It lies in the southeast portion of the Asian continent. It is bounded on the northwest by Bangladesh and India, on the southeast by Laos and Thailand, on the northeast by China, and on the south and southwest by the Andaman Sea and the Bay of Bengal. Burma has many mountains and three parallel rivers flow from north to south.
Burma covers an area of 261 thousand square miles, approximately the same size as the state of Texas. Except for the extreme north of the country, Burma has a tropical climate with three seasons. The dry hot summer runs from March to mid-June, the wet rainy season from mid-June to mid-October, and the cool winter season from mid-October to February. Burma receives rainfall mainly from the southwest monsoon. The amount of annual rainfall varies, depending on locality from 25 inches to over 200 inches per year.

According to the Burmese Government Reports, total population was 38.8 million in 1987, with an annual population growth rate of 2.1 percent. In 1987, Burma's peasant families numbered more than 4.3 million. Their farm size varied from under five acres to 180 acres. Average farm size for peasant families was 5.6 acres. Most Burmese farmers produce their crops by using draft animals such as buffalo and oxen. The average peasant family owns a pair of animals with basic farm implements such as the plow, harrow and intercultivator. One of every three families owns a cart for general transport.

Burma has been dependent on agriculture for economic growth and the well-being of its people. The agriculture sector earns 65% of foreign exchange earnings. It accounts for 45% of Gross Domestic Product (GDP) and employs 64% of the labor force. The goals of the agricultural sector were to provide for the needs of domestic consumption for a growing population; to produce sufficient raw
materials to meet the requirements of agro-based industries; and to obtain more foreign exchange by exporting surplus agricultural commodities.

In Burma, the Agriculture Corporation under the Ministry of Agriculture has responsibilities for implementing agricultural plans for 65 different crops cultivated in different agro-ecological zones, according to official government reports. Rice is the staple food for the population and the main source of foreign exchange from agriculture. Burma had 26 million acres in crops in 1987. Rice was grown on 12 million acres, or nearly one-half of the total cropland. Average yields of all crops were very low in Burma, compared to those in developed countries or some other countries in Asia. According to a 1980 Asian Development Bank Report, the agricultural sector in Burma performed poorly over the decade ending 1975-76. The growth rate in the sector, estimated at 1.6 percent per annum, was less than the growth in GDP (2.3 percent) or population (2.2 percent). The poor performance of the agricultural sector was a major cause of Burma's economic deterioration over the preceding decade (Asian Development Report 1980). Crop yields in Burma continue to be very low partly because most farmers still use traditional agricultural methods, but also because of deficiencies in agricultural policy, input supplies, credit, etc.

At present, the Agricultural Extension Service in Burma was a branch of the Agriculture Corporation under the Ministry of Agriculture and Forests. The Agricultural Extension Service in Burma
was mainly concerned with crop production; the other main function includes the distribution of agricultural inputs, such as fertilizers, pesticides and quality seeds. There was no relationship between the Agricultural Extension Service and the University of Agriculture or the College of Veterinary Science, which operate under the Ministry of Education. This separation results in a very weak linkage between research and extension.

Most extension programs or agricultural plans were prepared by top level management. Communication tends to be a one way downstream flow without farmer participation or feedback in the extension process. Therefore, many agricultural programs do not adequately reflect the needs and interests of their farmer clientele. Monthly progress reports for all aspects of agriculture, but were prepared at lower levels and passed to immediate superiors, but proper evaluation of agricultural programs was not undertaken as a basis for program improvement.

The emphasis in Burmese extension programs has been on techniques of agricultural production, but this effort has not been integrated into an overall agricultural development strategy. Therefore, it would be helpful to analyze some of the different agricultural extension models used in the world in the recent past, to explore their relative strengths and weaknesses, and thereby to develop recommendations for an improved agricultural extension system for Burma.
Role of Agricultural Extension in Agricultural Development

Agricultural extension is essential to the agricultural development process. Agricultural development is often seen simply as an increase in agricultural production. Economists often use a somewhat more precise definition of agricultural development: development occurs if more production is achieved with the same inputs of land, labor and capital (Van Den Ban 1988). Development of new technology and its application by farmers were indispensable in such development.

But, farmers cannot successfully adopt a new technology unless they become aware of it and learn how to incorporate it into their farming systems. Most farmers in less developed countries have used traditional agricultural methods. The problem lies not only in reaching small farmers with new technology but also in persuading them of its advantages over their traditional methods.

Improvement and adoption of farm technology can be accomplished by the combined and coordinated efforts of research and extension. In a functional technological system, linkages between research and extension must exist at both formal and informal levels. However, in many less developed countries, these linkages are often very weak because of institutional divisions. Research and extension may be segregated in different ministries or in widely separated departments of the same ministry. Successful extension work depends on having access to research results and programs to deliver these results to
the countryside. Extension is the link between researcher and the farmer. Research will be useless if its findings are not communicated to the farmers who face the practical problems of production. Farmers can solve production problems, if they have sufficient knowledge. Extension services help the farmer collect more and better knowledge and to apply it.

Extension has also played an important role in human resource development among farm and rural populations. Extension services have provided rural populations with leadership skills and management skills; this educational function was one of the main extension objectives. Extension helps the rural people to gain new skills and new attitudes toward various aspects of living. Extension also helps educate rural youth to become self-reliant in solving their problems, meeting the challenges of their environment and preparing leadership cadres for the future. Once again, however, the effective functioning of extension activities depends to a large degree on organizational structure (i.e., institutional building).

Extension services in less developing countries were frequently weak because of institutional, resource, management and other constraints. Farmers often had little or no opportunity to participate in the process of developing agricultural and educational programs. Need assessments and situational analyses were rarely carried out in developing agricultural extension programs. Instead, programs were planned from the top-down, rather than the bottom-up, in
most less developed countries. The top management, mostly politicians, generally had the authority to decide what kinds of programs were to be delivered through extension, including program content. Too often these educational programs were not based on the needs and interests of the clientele, but on the government's own objectives. In addition, the objectives of the programs were seldom realistic because they were usually set without consideration of available resources.

In many less developed countries, a decentralization of authority is regarded as reducing the control of top leaders. Therefore, decision-making is seldom delegated and almost never delegated to lower levels. Moreover, the efficiency and effectiveness of agricultural extension systems are also dependent on the educational backgrounds of extension workers and farmers. In less developed countries, the level of education and training for extension workers is relatively low. The number of well-trained persons is limited, and they are also responsible for nonextension activities, such as the distributing of seed and agrochemicals, credit authorizing and supervising credit, and so forth.

The source of agricultural inputs in most less developed countries does not reflect free market conditions; inputs are frequently controlled by the government. In addition, governments are often the sole or primary buyers of farm products and purchases at prices that are not attractive incentives to farmers. Agricultural plans in
communist or socialist countries are centrally planned and farmers might have little freedom of choice in what crops to plant and how to sell their agricultural products. Because of these problems, most less developed countries lack an appropriate and effective agricultural extension system that could help bring about a significant and continuing increase in agricultural production.

Various agricultural extension models have attempted to address and evaluate these potential problems in different ways. Although there is no single blueprint for "the best" extension model, it is very important to develop an understanding of functional systems that can help to meet the most urgent technological needs of farmers in less developed countries.

Research Problems and Objectives

The primary research problems are: a) What are the primary strengths and weaknesses of the Burmese extension system? How do these aspects affect its ability to disseminate improved agricultural technology to Burmese farmers, as well as to increase their human resource capacity to absorb improved technology (i.e., technical and management skills); and b) What are the primary strengths and weaknesses of the three primary extension models (see below) in performing technology transfer and improving the human resource skills of farmers? c) From the analysis of the weaknesses of the Burmese system, what factors (i.e., approaches, methods, etc.), from the
The overall goal of this research is to develop recommendations that would improve the overall performance of the Burmese national extension system to reach the major groups of farmers with improved agricultural technology and thereby increase their productivity, incomes and level of living. The specific research objectives are:

a) To describe and critique the Burmese extension system, using specific criteria, to identify its particular strengths and weaknesses,
b) To describe and critique the major extension models that are widely utilized in other countries, using the same criteria applied to the Burmese system, and
c) To make appropriate recommendations that may help strengthen the Burmese extension system on the basis of prior analyses.

**Definition of Terms**

**Innovativeness:** Innovativeness is the degree to which an individual adopts new ideas in comparison with others in the relevant social system.

**Less Developed Country (LDC):** According to the United Nations, the following are general characteristics that differentiate
between LDC and more developed country (MDC). LDC's have:

1. A relatively low per capita income
2. Comparatively low productivity per person.
3. Little commerce and high self sufficiency.
4. High rate of illiteracy.
5. Limited transportation and mass media facilities.
6. Inadequate nutrition.
7. Little industry and few skilled technicians.
8. Politically unstable governments

Kyat (Ks): Burmese currency; 6.10 Ks = US $1.00 (March 1988)

Model: Extension systems held to be worthy of transference to other situations. The United States Cooperative Extension Service (CES), the Training and Visit Management System (T&V) and the Farming System Research and Extension (FSR/E) are examples of current agricultural extension models.

Modernization: The process by which individuals and/or social systems change from a traditional way of life to a more complex, technologically advanced, and rapidly changing style of life. A change from a traditional method of cultivation to use of more productive, science-based methods is a kind of modernization. Here, modernization was not equated with Europeanization or Westernization.
**Peasant:** Farmers largely oriented to subsistence production and consuming a large portion of their production. Peasants and small farmers were used here as interchangeable terms.

**Social Change:** The process by which alteration occurs in the structure and function of a social system. The three steps involved in social change are invention, diffusion and consequence.

**Subsistence Farming:** Pure subsistence farming is defined as "a self-contained and self-sufficient unit where all production is consumed and none is sold; correspondingly, no outside consumer or producer goods and services are purchased."

**Traditional Agricultural Technology:** Traditional agricultural methods are those that have been passed on verbally and by demonstration from one generation to the next, based upon much observation and experience in local farming areas over the years.

**Improved Technology:** Refers to any standardized means for attaining a desired objective.

**Traditional Agriculture:** Farming in which the technology used has been developed by keen observation over time by people who lack knowledge of and access to science-based and industrial technology.
Limitations of the Study

The following limitations were recognized:

1. This study was limited to four main agricultural extension models/systems: The Cooperative Extension Service (CES) of the United States Land Grant Universities; Training and Visit (T&V) system; Farming System Research and Extension (FSR/E), and the Burmese agricultural extension system.

2. Availability of information on Burmese agriculture was very limited.

3. There was a general lack of research studies and data on agricultural extension and program planning in Burma.

Basic Assumptions

The following basic assumptions were made for this study:

1. Improved technology is important to agricultural production and most less developed countries do not have adequate technology to increase agricultural productivity.

2. There are better agricultural production technologies available than those now practiced by small farmers in less developed countries.

3. A priority assumed by this study is that Burma will concentrate on increasing farm productivity per family and per acre to meet the short and long-term food needs of all people of Burma.
4. For the immediate future, small farm agriculture, such as that in Burma, will continue to form the basic foundation on which the economy of the country rests.

5. An assumption was made that the Agriculture Corporation in Burma provided the researcher with correct information through a survey report done by Food and Agriculture Organization in 1988.
Agricultural extension has been defined and viewed in different ways by scientists and practitioners throughout the world, perhaps because it was organized to accomplish a wide variety of objectives. Leagans (1961) defined agricultural extension as "a kind of nonformal education and a two-way communication between client and source." According to his definition, agricultural extension is a process involving the communication of information from the source to clients who then appropriately apply the information and communicate the results back to the source. Agricultural extension is thus interactive and problem-solving programming.

Chang (1962) defined agricultural extension as an informal, out-of-school educational service for training and influencing farmers to adopt improved practices in crop and livestock production, management, conservation and marketing. According to Farquhar (1963) agricultural extension is a service or system that assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their level of living, and lifting the social and educational standards of rural life.
OECD (1965) defined agricultural extension as "the provision of informal education, including advice and information, to farm people to help them solve their problems. Improving the efficiency of the farm business, increasing farm incomes and raising levels of living has been its aim."

Swanson and Claar (1984) viewed agricultural extension as an essential component in the agricultural development process. They stated that agricultural development implied the shift from traditional methods of production to new, science-based methods of production that included new technological components, such as new varieties, cultural practices, application of fertilizers and pesticides, new crops and/or even new farming systems. To adopt these new production technologies successfully, according to their definition, the farmers must first learn about them and then learn how to use them correctly in their farming systems. For the adoption process to occur, an educational and communication input would be required. They suggested that agricultural extension had two dimensions because agricultural extension is an on-going process of getting useful information to people (the communication dimension) and then in assisting those people to acquire the necessary knowledge, skills and attitudes to use effectively this information or technology (the educational dimension).

Mathur (1976) mentioned that the term "extension" developed in the U.S., where this program operated in the universities under two different forms—university extension and agricultural extension.
University extension was primarily meant for those adults who could not attend regular classes in these universities. They could learn at home by correspondence or join night classes or summer schools when they were free from their professional or vocational work. Agricultural extension was meant for farmers who were taught improved farm practices on the farm and improved ways of living at their homes through extension methods such as group discussions, demonstrations, exhibitions, workshops, visits to homes, farms, etc. According to Mathur, the purpose of agricultural extension was to remove difficulties and/or to help solve problems of farmers. The extension agent was responsible for giving complete, correct and scientific information to farmers.

Swanson and Claar (1984) have pointed out that "agricultural extension" was a difficult term to define precisely because the agricultural extension service had been organized in different forms to accomplish a wide variety of objectives. Thus, different types of agricultural extension models have emerged in the world. However, these different models or approaches have some common features. They note that "some people tend to equate agricultural extension with the term 'technology transfer'. This was incorrect, because technology transfer included the additional functions of input supply and agri-services." According to Baker (1984) technology transfer was "an integral part of the extension process, involving the transfer and spread of technology and information or know-how from information sources or developers through those who communicate it to those who receive it."
Development of Agricultural Extension

According to True (1928), the forerunner of agricultural extension in both Europe and North America was the agricultural societies. The first agricultural society, says True, was in Scotland with the name of the "Society of Improvers in the Knowledge of Agriculture," begun in 1723. There were other early agricultural societies in different parts of the world. The American Philosophical Society was founded in 1744 under the leadership of Benjamin Franklin. This society published many scientific articles on agricultural subjects, and its work led to the establishment in 1785 of the Philadelphia Society for Promoting Agriculture (True 1928).

"The first agricultural society in Germany was established in 1764. In France there was an early Society of Agriculturalists that was succeeded by the Academy of Agriculture of France, which began the publication of proceedings as early as 1761. In Russia, the Free Economical Society was established in 1765. This society had a large experiment farm near St. Petersburg" (True 1929: 6-7). These agricultural societies were formed with three objectives, according to True: 1) to acquaint their members with what was being done to improve agriculture; 2) to establish local agricultural organizations; and 3) to disseminate agricultural information through their publications, newspaper articles and lectures.

True (1928) reported that the Massachusetts Society for Promoting Agriculture sent out 1000 copies of a letter to stimulate farmers to
improve agriculture. Two clerks were asked to read this letter in
town meetings. The next year the society reported that numerous town
societies were in operation. Other North American agricultural
societies held agricultural fairs in their early years, not merely for
the sale of animals or farm products, but for educational purposes. A
notable early example was the lecture by John Lowell at a fair held by
the Massachusetts Society at Brighton in 1818 (True 1928).

Extension-type programs were begun in North America in 1843, when
the Committee on Agriculture of The New York State Assembly suggested
that "the legislature might authorize the State Agricultural Society
to employ a practical and scientific farmer to give public lectures
throughout the state upon practical and scientific knowledge" (True
1928: 4).

In Ohio in 1845, N.S. Townshend, afterwards Dean of the College of
Agriculture, suggested that the State Agricultural Society might
select a sufficient number of competent individuals to lecture on all
the sciences having relations with agriculture (True 1928: 4).
According to True, Townshend also advocated the formation of farmers' clubs in every township. During these meetings there were lectures on
the sciences and their application to agriculture and club members
shared their knowledge and experiences with each other.

In 1848, when the office of State Agricultural Chemist was created
in Maryland, the act required him to deliver "one public lecture in
each elective district and a course of lectures at each county town and some central place in Baltimore county" (True 1928: 5).

In 1853, farmers' institutes were established in the U.S. at the recommendation of Edward Hitchcock, President of Amherst College and a member of the Massachusetts State Board of Agriculture. The farmers' institutes became the primary educational forerunner of agricultural extension in the U.S. When agricultural extension was formally established in 1914, there were 8,861 farmers' institutes in the U.S. (True 1928).

According to Jones (1982) "the first, modern, agricultural advisory and institutional service was established in Ireland during the great potato famine in the mid 19th century." It operated from 1847 to 1850. Itinerant practical instructors worked among peasant farmers in the areas worst affected by the potato blight disease. Initially ten in number, the effort increased to "33 instructors at the peak of this extension-type activity" (Jones 1982: 11).

The developments of agricultural extension and agricultural education were concurrent. True (1929) reported that the university extension system was introduced in the U.S. through city libraries. By 1890, the American Society for the Extension of University Teaching was established. In 1891, the state of New York provided $10,000 for university extension. The universities of Chicago and Wisconsin began organizing extension programs in 1892. The Land Grant Colleges in the U.S. were strongly influenced by the university extension movement and
other extension-type activities. Eventually these activities led to the formal establishment of the Cooperative Extension Service.

The United States Department of Agriculture (USDA) assigned Seaman A. Knapp as its first Extension Agent in 1902. In 1904, Knapp introduced the demonstration method of teaching by agents in the field. Knapp performed Farmer's Cooperative Demonstration work in several southern states. He made a success of his demonstration on cotton boll weevil control in Texas. His pioneering effort in establishing demonstrations gave considerable momentum to extension work by the time of Knapp's death in 1911.

At this time the Office of Farm Management at USDA was also assigning agents to study farm management problems and prevailing systems of farming, and to conduct on-farm trials of new crop varieties (True 1928).

There was also strong interest in extension-type activities within the private sector of the U.S. Boards of Trade, grain associations, bankers, railroads, and other commercial concerns were financing extension-type activities, such as agricultural trains, to inform farmers about improved methods of farming.

The Land Grant colleges were involved in many of the early agricultural extension-type activities. They worked closely with the Farmer's Institutes, conducted local experiments as a means of teaching, prepared and distributed extension bulletins, and conducted correspondence courses. By 1907, 42 colleges in 39 states were
involved in extension-type activities, and many were establishing departments of agricultural extension. By 1910, 35 colleges had such departments. All of these efforts culminated in the passage of the Smith-Lever Cooperative Extension Act in 1914. In 1917 the Smith-Hughes Act provided corresponding support for vocational agricultural and home economics education for rural young people in secondary schools (True 1928).

According to True (1928), the spread of agricultural extension-type activities in Europe, Australia, New Zealand and Canada tended to parallel events in the U.S., but their organizations developed somewhat differently. Baker (1984) said that agricultural societies, popular in Canada as well as the U.S. in the 18th and 19th centuries, organized informal learning by using their members to disseminate practical agricultural information to other farmers.

Swanson and Rassi (1981) reported that the development of agricultural extension organizations in Third World countries occurred mainly after World War II. In Asia, Latin America, and the Caribbean, the majority of national organizations were started in the mid 1950's. The introduction of agricultural extension organizations in African nations was somewhat later, mostly in the 1960s and 1970s.

Swanson and Claar (1984) pointed out that the rise of general agricultural extension organizations was fostered by foreign assistance in most Third World countries. These countries did not have well established colleges of agriculture when they became
independent. Therefore, agricultural extension was usually attached to the ministry of agriculture, so that there was only a weak relationship between extension and agricultural colleges, once the latter were established.

However, there had been some extension-type activities in many Third World countries earlier in the century. Colonial governments sponsored research and extension-type activities for crops such as sugarcane, rubber, palm oil, groundnuts, tea and coffee because they were interested in increasing the export of these crops. Research and extension for traditional food crops, however, was seldom given any attention by colonial governments (Swanson and Claar, 1984).

This observation was supported by the Burmese experience. Burma was under British rule from 1885 to 1948. The British government realized that Burma had much cultivable yet unused land, and it organized capital and technological investments in rubber estates in Burma about one hundred years ago (World Bank Report 1978). Subsequently, the colonial government in Burma also sponsored extension-type activities for other crops such as rice, sugarcane, and peanuts.

According to Prawl et al. (1984), every extension system had a sponsoring agency, usually a governmental department or bureau. These vary tremendously in organizational form, but most extension organizations were staffed by individuals trained in the technical aspects of agricultural production. Prawl et al. (1984) reported that
the world's first nationwide and government sponsored agricultural extension system was initiated in 1893 in Japan. Similar systems followed in other countries as shown below:

<table>
<thead>
<tr>
<th>Country</th>
<th>Year of Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>1893</td>
</tr>
<tr>
<td>United States</td>
<td>1914</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1946</td>
</tr>
<tr>
<td>Israel</td>
<td>1948</td>
</tr>
<tr>
<td>India</td>
<td>1952</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1952</td>
</tr>
<tr>
<td>United Arab Republic</td>
<td>1953</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1953</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1954</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1955</td>
</tr>
<tr>
<td>Brazil</td>
<td>1956</td>
</tr>
<tr>
<td>Belgium</td>
<td>1957</td>
</tr>
</tbody>
</table>

In addition to those listed above, many other countries established agricultural extension systems after World War II, after independence, as noted earlier.

Different Categories of Agricultural Extension

The literature revealed various attempts to delineate categories of agricultural extension systems. Lele (1975) categorized extension
systems broadly under two major headings: the "take it or leave it" type (where farmers were free to accept or reject innovations) and the "contract farming" type (where farmers volunteer to receive innovations and were in effect granted a contract to produce certain commodities).

Blanckenburg (1984) classified agricultural extension into three types on the basis of public arrangements:

The Sectorial Governmental Service Type. This type was the most commonly occurring arrangement. Generally, a Ministry of Agriculture assigns the main responsibility for agricultural development to a Department of Agriculture. The Department of Agriculture had divisions concerned with research, extension and training, as well as others responsible for technical, economic, financial and administrative matters. The extension division was usually small, but had a clear line of command from the national level to village level via division, district, or comparable political/geographic units. In many countries, agricultural extension agents were also asked to undertake other noneducational tasks, such as regulation, data collection, supply distribution, etc.

The Subsectoral, Parastatal Intervention Service Type. This type of agricultural extension was based on parastatal intervention societies. This type was usually found in West African countries that were formerly under French colonial rule. Extension work usually dealt with one or a few important crops only, or took
responsibility for rural development in a specified region. The
extension unit generally had a high degree of autonomy; the
Ministry of Agriculture to which it was responsible limits its
concerns to overall planning, coordination and regulatory work.
Unified Service, with Mobilization of Local Resources Type. The
third basic form of extension service cited by Blanckenburg
developed in two far eastern countries: Korea and Taiwan. This
type showed:

a. Mobilization of resources at the local and regional
   level.

b. Strictly decentralized extension programming.

c. Development work entrusted exclusively or almost
   exclusively to one service.

Baker (1984) also classified three types of extension: (1) Public
Sector Extension that incorporates "all direct or indirect technology
transfer/extension operations paid for by public funds," such as the
government or universities; (2) Private Sector Extension that was paid
for by private funds such as fertilizer companies, financial agencies
or other profit-oriented firms; and (3) Voluntary Sector Extension
that was paid for by such volunteer organizations as farm societies or
commodity groups.

Ray (1985) recognized three categories that had obvious structural
similarities to the foregoing "types" of extension organizations: 1) the
directive, 2) the participatory, and 3) the contractual. Axinn
also categorized approaches by point of control: the "delivery" approach (top-down, supervisory, supply-driven) and the "acquisition" approach (bottom-up, farmer-determined, participatory, demand-driven). In the industrial and high income countries with more highly educated farmers, he says, extension had become demand-driven. In the low resource, less developed countries, extension had become supply driven, and involves hierarchical, top-down, technology-packaged delivery systems.

Pickering (1987) divided agricultural extension into six approaches as follows:

1. the commodity-focused approach
2. the community development-cum-extension approach;
3. the technical innovation centered approach;
4. the training and visit system approach;
5. the "animation" rural approach and;
6. several more or less overlapping other approaches.

Weidemann (1987) enumerated seven categories for extension delivery as follows.

1. conventional agricultural extension approach;
2. training and visit approach;
3. university-organized approach;
4. commodity development and production approach;
5. integrated agricultural development programs;
6. integrated rural development programs;
7. farming systems approach.

Baxter, et al. (1987) classified agricultural extension into four major systems: 1) rural extension; 2) commodity-specific extension; 3) university-based extension, and 4) ministry of agriculture field service extension.

Rivera et al. (1988) classified agricultural extension services into three according to institutional settings:

1. **Agricultural (production-related) Extension Services**: In this case, extension institutions undertake production-related knowledge transfer either as their sole function, or as their primary function with adjunct service activities and programs not strictly production-related (e.g., youth development work).

2. **Integrated Agricultural Extension Services**: This type involves institutions that include agricultural extension as an integrated function along with one or more other functions, as with certain agricultural research programs, cooperatives, etc.

3. **Supportive Information Transfer Services**: This type includes institutions that consider information transfer as a supportive function auxiliary to their main concerns (e.g., seed and fertilizer companies).
Rivera (1988) had also examined agricultural extension from the standpoint of its purposes rather than its organizational form:

1. **Agricultural performance.** Agricultural extension was viewed only in terms of improving production and profitability of farmers.

2. **Rural Community Development.** Agricultural extension was viewed as serving to advance rural communities, including improvement of their agricultural development tasks.

3. **Comprehensive Nonformal Continuing and Community Education.** Agricultural extension was viewed as a provider of nonformal continuing education to various audiences in agricultural areas.

The preceding review of the agricultural extension literature—though brief in terms of the voluminous writings on extension, technology-transfer, adoption and diffusion of innovations, etc.—does illustrate the difficulty of achieving a single, multi-purpose categorization of extension efforts. Some conceptual trends were evident: top-down vs. bottom-up approaches (Axinn 1987), integrated vs. commodity or other area-specific approaches (Rivera et al. 1988), production-focused vs. community-focused work (Rivera 1988), centralized vs. decentralized efforts, etc. It was not surprising, however, that the global diversity of farming systems, development needs, governmental forms, and so forth resisted an easy classification of agricultural extension efforts.
In any case, it was not the intent here to produce a theoretical schema for agricultural extension in less-developed countries such as Burma. Rather the aim was to examine three practicing systems of extension, and to see what lessons they might hold as "models" for Burma's system.

Main Approaches (Models) of Agricultural Extension

These three systems are: 1) the U.S. Land Grant University Cooperative Extension Service (CES) model; 2) the Training and Visit (T & V) model; and 3) the Farming System Research and Extension (FSR/E) model.

The model that had been successfully used for many years in the U.S. and some other countries was the U.S. Land Grant University or CES model. The gradual development of the "science" of agriculture in the U.S. followed creation of the USDA and Land Grant Colleges in the 1860s (True 1928).

The Morill Act of 1862 had been credited with having been not only the most significant legislation regarding agricultural extension, but also the most important single piece of social legislation in the history of the United States (Boyle 1981). The Morill Act promoted the idea that education was to be made available to anyone, not just the privileged few. More important, from the extension point of view, it established the Land Grant Colleges, at least one in every state. Twenty-five years later (1887), the Hatch Act created the State
Agricultural Experimental Stations, which provided a research dimension and broadened the relationship between the USDA and the Colleges. When the Smith-Lever Act (1914) created the Cooperative Extension Services, these Land Grant Colleges provided an ideal institutional base for an organized, structured, educational system, that helped the CES attain its main objective: "to aid in diffusing among the people of the U.S. useful and practical information on subjects relating to agriculture and home economics and to encourage application of the same" (Boyle 1981). The Cooperative Extension Services in the U.S. were widely acknowledged as the largest problem solving educational system in the world (Vines and Anderson 1976). CES provided informal, noncredit education. All agricultural extension education programs were based on local needs. The CES works under conditions of rapid change in the technological services available for farm people, and it had a strong link with research. The U.S. Land Grant Colleges, with their three way tradition of research, extension and resident instruction, were largely independent of external governance and avoid supply and marketing functions (Rivera 1987).

The Training and Visit (T & V) system of extension was developed by an Israeli, Daniel Benor, who was Israel's Director of Extension from 1950–65 (Rivera 1987). The basic technique of the T & V system was systematic training of village extension workers, combined with regular visits by the village extension worker to farmers' fields.
The village extension worker delivers technical information to "contact" farmers, who were expected to transfer this information to other farmers in turn. T & V or a version of it had been widely adopted in both Asia and Africa by the World Bank in the late 1970's. Riveria (1987) reports that 65 countries were using the T & V system, and nine of them have adopted it as the organizational form for their national extension service.

The third agricultural extension model, used in some developing countries, was Farming Systems Research and Extension (FSR/E). According to Zandstra (1986), FSR/E originated in the late 1960s with the notion that inefficient resource use causes low productivity, and with the realization of limits in technology transfer from Western to Third world systems. The term "farming systems" was applied in the 1970s in several different contexts around the world (Riveria 1987).

In the 1980s, the generic term "Farming Systems Research" came into more common use (Byerlee et al. 1982). According to Russell (1981), farming systems research was defined as "the application of a systematic analysis to agricultural research development, implementation and evaluation. Farming systems research takes a holistic overview of the different component systems which interact with the farm. These component systems include social, technological and political aspect." According to Byerlee et al. (1982), the farming systems approach included two basic components—research and development. This concept was similar to that used by Shaner et al.
(1982) who termed it Farming Systems Research and Development. The term FSRD was widely used until recently (when FSR/E became common). Terminology aside, there was now substantial consensus on the basic assumptions, methodologies and objectives of FSR/E, which explicitly addressed the need for linkages among researchers, extension workers and farming systems.

FSR/E had five basic activities, as explained by Shaner et al. (1982):

1. Target and Research Area Selection (Site Selection)
2. Problem Identification and Development of Research Base (Diagnosis)
3. Planning On-Farm Research (Design)
4. On-Farm Research and Analysis (Research)
5. Extension of Results (Extension)

FSR/E aims at research and development on selected sites in given areas, with eventual extension of the results to outlying farmers. Interdisciplinary research teams were essential.

The extension systems of many less developed countries were more or less similar to each other, and differ in many ways from the three above extension models (CES, T & V, and FSR/E). The precursors of extension-type services were established in many less-developed countries (including Burma) by former colonial governments, and usually have most of the following characteristics (Singh 1967):
1. The service was connected to a government ministry
2. It existed separately from research or teaching institutions, both in terms of physical location and functional pattern.
3. It operated under a centralized hierarchial administrative system.
4. It included educational, supply service and regulator functions combined in a single agency.
5. It was under pressure of production targets and tends to implement pre-determined programs.
6. It was subject to great political control.

Main Criteria Used in Assessing Extension Systems

Swanson et al. (1988) formulated several criteria by which to evaluate the effectiveness and efficiency of agricultural extension systems, including public policies related to agricultural technology, technology utilization, and the linkages that integrate the whole (Sands 1988).

Research-Extension Linkage

Discussions on the importance of the linkage between extension and research were very common in the literature (e.g., Mosher 1981; Blanckenburg 1984; Johnson and Claar 1986; Stavis 1979). However, a wide gap between research and extension continued to exist in many less developed countries. Crawford (1982) reported that one of the
major historical problems with technology generation and diffusion had been the separation of research and extension functions. Without extension, research efforts were futile, and without research there was nothing to extend. The World Bank (1985) identified this gap as the most serious institutional problem to overcome in developing an effective extension system.

**Adequate Financial Resources**

The importance of assessing public expenditures on the agricultural sector had been examined by Cox (1984), Elias (1981), and the F.A.O. (1984). Adequate financial resources were largely dependent on governmental policy—in practice rather than rhetoric—toward the agricultural sector. Many agricultural development programs fail because they lack efficient government services, especially financial commitment, to the agricultural sector (Van Den Ban 1988). Wharton (1976) reported that technology cannot be extended easily in the absence of adequate political and financial commitment.

**Adequate Human Resources**

In an extension program, the human resources were researchers, administrators, technicians, field staff and others in the community. These individuals were so important that social scientists identify them as "human capital" (Malone 1983). One of the major constraints
on the success of extension services was lack of adequate investment of human capital, partly because there was often a shortage of well-trained personnel. The success or failure of an extension system depends largely upon having an adequate number and mix of competent extension personnel (Coombs and Ahmed 1974; Claar and Benz 1984; and Benor et al. 1984).

Program Development Procedures

Program planning in extension involved a careful analysis and interpretation of clientele needs, research findings, advisory group concerns and environmental situations to determine the directions future program planning should take. According to Boone (1985) an educational program can be defined as a comprehensive, systematic and deliberate effort to bring about a system. There were six types of changes on which educational programs should focus, as suggested by Boyle (1981). These were (1) individual change, (2) group change, (3) political change, (4) cultural change, (5) economic change, and (6) technological change. According to Boyle (1981) program development was the art of designing and implementing a course of action to achieve an effective educational program; Prawl et al. (1984) added "evaluation" to this list. Baxter (1987) suggests that international organizations should encourage developing countries to plan more systematically for agricultural development programs because most developing countries do not have specific procedures for this job.
Prawl et al. (1981) pointed out that few persons were program development experts; in the U.S., program development specialists were usually appointed for each state, and one of the reasons why most less developed countries do not have a specific program development procedure may be due to lack of specialists in this area.

**Extension Delivery and Technology Transfer**

Extension delivery and technology transfer were carried out with the aid of various techniques, ranging from the use of mass media to individual meetings where farmers receive more detailed information on new or improved agricultural practices. Van Den Ban (1988) classified extension methods into three categories: individual, group, and mass media. Blanckenburg (1984) defines media as "the individual instruments used for information and advisory work." He defines method as "the mode in which extension makes use of the media."

Individual methods involve face-to-face contact between an extension worker and a client. Ekpere (1974) identified individual contact as "the most important single instrument... in a predominantly nonliterate society". Group extension methods involve contact between the extension field worker and a gathering of the clientele. The demonstration, field day, and group meeting were such methods (Ekpere 1974; Van Den Ban 1988). In agricultural extension, mass media consist of instruments created to transmit technology to a large audience (Blanckenburg 1984). The media identified by Stavis (1979) include "newspapers, radio, television, cinema, books, and magazines."
Time Allocation to Educational Duties

An extension system cannot be truly effective if extension workers must devote more of their time to noneducational duties than to educational activities (Benor 1984; Sigman and Swanson 1984; and Blanckenburg 1984). Stavis (1979) identified various noneducational activities such as "policing, debt collecting, data collection, general reporting, and input supply and rationing. Watts (1984) noted that "the possibility of extension being assigned noneducational duties to implement government policy was greater when the central government was organized in a top-down fashion." Watt and Claar (1983) pointed out that extension, in many countries, was a "carrier" of governmental policy.

Technology Utilization

Technology utilization by farmers was a good indicator to measure effectiveness and efficiency of an agricultural extension system. Sands (1988) suggests that appropriate indicators were not only the adoption and use of improved technology but also the access to and availability of physical inputs such as seeds, fertilizers and agrochemicals. According to Sands (1988) the "sub-indicators" relating to these factors were government pricing policy, availability and use of agricultural credit, access to agricultural technology, and level of education of clientele. Generally, price policies were set
by governments and were instrumental in creating incentives or disincentives for farmers to increase or decrease production (Sands 1988; Swanson et al; 1989). Discussions of pricing policy and its effects were common in the literature (e.g., Brown 1978; Bale 1985; Cox 1984). Agricultural technology was frequently embodied in purchased inputs such as high-quality seed, tools, chemical fertilizers and pesticides. Hence, access to credit can determine farmer access to technology. Wortman and Cummings (1978), Adams and Graham (1984), and the World Bank (1986) have discussed concerns about access to credit. Axinn (1984) suggested crop production "as one of the most important criterion to assess the success of an agricultural extension system:

"If the farmers produce more, agricultural extension may receive the credit, at least in part."

Monitoring and Evaluation

Monitoring and evaluation activities of extension systems in less developed countries have often been neglected. Blanckenburg (1984) suggested that more attention should be given to these activities because in-depth evaluation can effectively contribute to improving extension services. Frutchey (1959) defined extension evaluation as "the use of the scientific approach in providing facts as a basis for making decisions, drawing conclusions, or forming judgements about the organization and conduct of extension work."
According to Cernea and Tepping (1977), monitoring and evaluation were closely related. Monitoring of extension projects consisted of timely data gathering on the work of the extension service and the performance of its agents, as well as the acceptance or nonacceptance by farmers of the extended advice. Evaluation, in turn, was the assessment of the overall effects of extension programs on production levels and on farmers' welfare, to determine the degree to which the program was reaching its economic, technical and social targets.
CHAPTER III
RESEARCH METHODS

The primary sources of information for this study were publications, program reports, and similar documents in the case of the CES, T & V, and FSR/E models of agricultural extension, but information about the Burmese Agricultural Extension Service was more difficult to collect. There were few publications that deal with the Burmese agricultural extension. In fact, the number of documents about Burmese agriculture in general was negligible compared to publications about agriculture in other Asian developing countries such as India, Thailand, Indonesia, and the Philippines. Data on Burma were not very current, but there was some information about the social, economic, educational, and political situation in the country. The personal experiences of the researcher was another source of information on the Burmese extension system.

The literature focusing on the eight indicators and related measures (see below) used to analyze agricultural extension systems, especially the Burmese system, was searched with the help of five computer databases (AGRIS, AGRICOLA, CAB, ERIC and DA). These were chosen because they contain extensive references to international
agricultural development. However, it was not possible to assess the empirical validity of the indicators and measures because they were examined outside an experimental or quasi-experimental framework.

Criteria To Be Used in Analyzing the Burmese Extension System and Three Extension Models

The following indicators (criteria) and measures were the means used to analyze the four agricultural extension systems of interest.

Research and Extension Linkage

This criterion has been generally accepted as one way to determine if an agricultural extension system has the ability to develop new technology and/or enough research-generated knowledge to transfer effectively to farmers. Although it was not easy to measure quantitatively the strength of the linkage between research and extension, the nature and frequency of interactions between research and extension can be examined. It was assumed that such contacts determine whether the flow of technology and research results to farmers was adequate and appropriate. Another indicator of the degree of linkage between research and extension was access to external knowledge and technology. This indicator was important because access to externally developed technology can be an efficient means by which a country can "borrow" research and adapt it for home country use. Thus the linkage between extension and research was here measured both internally and internationally.
**Adequate Financial Resources**

A government's financial commitment to the agricultural sector, one of the indicators for this criterion, presumably shows how important the government considers agriculture in relation to other sectors of the economy. This measure involved the average annual rate of total expenditure on the agricultural sector over a specific period. If the data were shown in time series, the information provided trends that help to identify the degree and consistency of support for the agricultural sector by the government.

Another indicator of adequate financial resources was "investment in agricultural research and extension in terms of government expenditures." In addition, private sector involvement in agricultural research was also another source of finance. An extension system can be examined in terms of whether it works in cooperation with private research organizations.

**Adequate Human Resources**

This indicator involved one of the most important factors associated with agricultural extension systems.

a. The first measure was the extension agent/farm family ratio, one of the most widely used measures in the literature to assess the capacity of an extension system to serve its clientele. The recommended ratio (for a T & V system) was 1:800 (Benor et al., 1984).
b. The second measure was the number of subject matter specialists as a percentage of the total number of professional extension staff. It served to assess the capacity of extension service to provide technical backstopping and training for field personnel.

c. The third measure was the educational qualifications of professional and technical extension personnel. It provided information on the quality of human resources available to carry out extension programs.

d. The fourth measure was the type of training given to extension workers and personnel management procedures. By examining the status of extension personnel management system, it was possible to assess if the system has a proper personnel management procedure or not.

Program Development Procedures

This criterion indicates: (a) whether the extension system has a proper program development procedure; (b) how the extension program was developed "top-down" or "bottom-up"; and (c) how well the administrators or planners were acquainted with program development. The importance of farmer participation in program development process was widely acknowledged. Perhaps the most useful proxy by which farmer participation can be assessed was an examination of existing farmer organizations.
Extension Delivery Methods (Technology Dissemination)

Measures of technology dissemination that can be used to examine extension activities occurring at the individual, group and mass media levels (as well as the capacity of extension to produce its own teaching materials and farmer handouts) include not only the extent to which extension programs use such techniques, but also the ability of the clientele to receive specific dissemination techniques (e.g., radio or television ownership). The following measures were considered most effective for an analysis of technology dissemination.

a. The average of the number of farm/home visits made annually by extension agents.

b. The average number of group meetings initiated by extension agents on an annual basis.

c. The average number of "result" demonstrations conducted per agent on an annual basis.

d. The average number of farmers who visited an extension office annually.

e. The capacity of extension to produce mass media outputs and teaching materials.

f. The estimated percentage of farmers obtaining agricultural information from radio and the number of minutes per week that technical information was broadcast to farmers. Radio offers high potential in communicating to rural farmers in less developed countries. The percentage of farm households
with radio or number of radio sets per farmer was taken as a proxy for households receiving agricultural information by radio.

**Time Allocation to Educational Duties**

The time allocated to extension education and related activities (vs. other duties), an indicator, was measured (or estimated directly) from workers' time budgets.

**Technology Utilization Barriers**

There were many possible measures of technology utilization by farmers. However, this study limits itself to the following more feasible measures associated with technology utilization.

*Government pricing policy.* This measure compared domestic price to world market price for important crops to indicate whether the given price was a reasonable incentive for a farmer to produce a given crop. The assumption behind this measure was that crop production will likely be encouraged if domestic crops prices were near or at world prices.

*Availability and utilization of agricultural credit.* In most less developed countries, small farmers cannot pay for agricultural imports. Availability and proper use of agricultural credit affects technology utilization. The first measure here was how small farmers receive agricultural credit and how they use it.
The second measure was whether the government supported and improved credit institutions adequately.

**Access to Physical Inputs.** This indicator provided an estimate of the average distance between farm families and import supply points, and measures the supply of physical inputs over time. For example, recommendations on fertilizer use cannot be followed unless an adequate supply of fertilizer was available in proximity to farmers. If the data show yearly supply and demand, they provide information on trends in input availability.

**Production.** Technology utilization can be measured by observing the agricultural land index and agricultural output for a period of time in a region or country. This measure assumes that most of any large or sustained increases in agricultural production were due to yield increases brought about by technology rather than land area expansion.

**Monitoring and Evaluation.** This measure assesses of the extent to which monitoring and evaluation procedures were used by an extension system.

**Analysis**

Each of the four agricultural extension systems of interest will be analyzed comparatively by using the specific criteria described. However, it must be recognized that some criteria overlapped. Hence, no individual indicator or measure was diagnostic in isolation, but in sum the indicators provide a useful overview of the comparative effectiveness of an agricultural extension system.
CHAPTER IV
FINDINGS

Background History of Burmese Agriculture

The road to establishment of agricultural extension services in Burma began about 1885 with the research and extension-type activities sponsored by the British colonial government. In Burma, "the first college of agriculture, combined with a research institute, was opened in 1924 under the Director of Agriculture in the Ministry of Agriculture" (UNESCO, 1971). According to the FAO, the Agriculture Department itself had been established in 1901.

Kelsey and Hearne (1963:450) noted that a "well organized" Burmese Extension Service was organized in 1954:

"Agriculture extension was well organized very recently in the countries and territories of Asia and the Far East as a regular government function although there had been previous extension activities in these countries. Many agricultural experiment stations, agricultural training institutions, church bodies, and farmer's organizations were doing all sorts of agricultural improvement work in those countries for decades without being systematically coordinated or under any specific name. . . dates of establishment of extension services as presently organized in different countries and territories of the region are Burma 1954, Cambodia 1955, Ceylon 1957, East Pakistan 1952, Hong Kong 1951, . . . Thailand 1950, and Vietnam 1955."
More specifically, a Burmese extension service was set up when the Agricultural and Rural Development Corporation (ARDC) was established in 1954 under the Ministry of Agriculture and Forests. ARDC was concerned with rural agricultural development. Its major functions were extension activities to further development of important crops, especially industrial crops such as jute, cotton, sugarcane, tobacco, mulberry, etc; to provide adequate supply of agricultural inputs such as fertilizers, pesticides, credit, advance purchases, quality seeds, etc; to aid the construction of flood control dams and drainage systems; to enhance land reclamation and improve rural water supplies to foster livestock breeding and marketing and introduction of agricultural machineries. The Agriculture Department -- a separate area of the Ministry -- took responsibility for routine work such as agricultural data collection, seed farms, and agricultural experiment stations. The extension activities of the Agriculture Department were confined to a few exhibitions, generally held in urban areas for special occasions and to the distribution of seeds and pesticides. Most of the agricultural experiment stations had been established by the British colonial government with its their special interest in exportable crops.

In 1974, the government of the Socialist Republic of the Union of Burma (SRUB) reorganized all departments and corporations in order to cope with the new constitution. This resulted in the establishment of the Agriculture Corporation by combining three former government agencies: the Agriculture Department, ARDC and the Land Use Bureau.
In April 1989, the state law and order restoration council announced that the country's name was changed from Burma to Myanmar and from Agriculture Corporation to Myanmar Agriculture Service.

Population

According to USAID, the total population of Burma was 38.8 million in 1987 with an annual growth rate of 2.1%. The birth rate per 1000 was 35.8 and the death rate was 11.1. Life expectancy was 56 years and the infant mortality rate was 103 per 1000. Sixty-six percent of total population was functionally literate and 85 percent of the total population lived in the rural Burma. Sixty-four percent of the economically active labor force worked in the agricultural sector. Average farm size was 5.6 acres, which was a relatively large amount for small farmers in Southeast Asia. Table 2 shows the size distribution of land holdings and the number of peasant families per land-size category in 1985-86.
Table 2

Peasant Families and Size of Holdings in 1985-86

<table>
<thead>
<tr>
<th>Size of Holdings</th>
<th>Numbers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Families (1000)</td>
<td>Acres (000)</td>
</tr>
<tr>
<td>Under 5 acres</td>
<td>2,612.6</td>
<td>6,052.6</td>
</tr>
<tr>
<td>5 to 10 acres</td>
<td>1,051.0</td>
<td>7,549.4</td>
</tr>
<tr>
<td>10 to 20 acres</td>
<td>493.0</td>
<td>6,878.6</td>
</tr>
<tr>
<td>20 to 50 acres</td>
<td>106.1</td>
<td>2,872.5</td>
</tr>
<tr>
<td>50 to 100 acres</td>
<td>1.5</td>
<td>97.5</td>
</tr>
<tr>
<td>100 acres and above</td>
<td>1.0</td>
<td>736.6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>4,265.2</td>
<td>24,197.2</td>
</tr>
</tbody>
</table>


Role of Agricultural Sector in the Burmese Economy

Agriculture has been a vital part of the Burmese economy. Its contribution to the country's GDP was 35% in 1965 and 48% in 1986 (World Development Report, 1988). Agricultural products, primarily rice and teak, accounted for about 85% of all exports in 1984-85 (Asia Yearbook, 1985). Rice was the most important crop in terms of export and domestic consumption and was planted on slightly more than 50% of the total cropland area (25 million acres) and accounts for more than one-third of total agricultural output. In 1986-87, about 13 percent
of total cropland area was under irrigation and cultivatable but unused land was about 21 million acres (FAO, 1987).

Apart from rice, the other main crops include sesame, pulses, groundnut, industrial crops, and plantation crops. In Burma, the agricultural sector provides not only much of the needs of domestic food consumption (particularly rice, cooking oil and food legumes) but also the raw materials required for agro-based industries such as textile mills, sugar mills, jute mills, etc.

In terms of food production, rice was the staple food crop and Burma had no population pressure, shortage of food stuffs, shortage of fertile land, or other natural resources. There had been no starvation in Burma. Rice production was greater than the amount required for domestic consumption, which was estimated at 250 kg of paddy per capita per year. According to FAO reports, rice production in 1986 was 15 million metric tons; only 9.4 metric tons was required for domestic consumption. Most of the remainder goes into export channels.

Natural Resources

Burma had abundant natural resources including minerals, arable land, and forests. Mineral resources include tin, antimony, lead, zinc, silver and other metals; jade and other precious stones; and petroleum and natural gas. Exploration for mineral resources was very far from complete. Fossil fuels were mostly for domestic consumption. There were excellent land resources, including some 25
million acres of cultivated and fallow agricultural land, and another 21 million acres of potentially cultivatable land. The reserved teak and hardwood forests cover an area of more than 24 million acres, and total forest area was 54 million acres (Report to Pyithu Hluttaw, 1984-85). It was estimated that 75 percent of the world's teak stock was in Burma (1963 yearbook of Far Eastern Economic Review).

In addition, Burma has potentially large offshore fisheries. Most natural resources have not yet been fully exploited.

**Government**

Burma was an independent monarch until 1885, when it came under British rule. Modern independence was achieved in 1948. There was a parliamentary government from 1948 to March 1962 except in the "caretaker" government (1958-1960) led by the Chief of Staff General Ne Win. Again seizing power in a coup in March 1962, General Ne Win established a new revolutionary government. Based on a 1974 constitution, the government was divided into legislative, executive and judicial functions. The People's Assembly (Pyithu Hluttaw in Burmese) was the Chief organ, but power was actually exercised by the State Council, the top decision-making body. Governmental mandates were renewed every four years through elections.

**Politics**

The Burma Socialist Program Party (BSPP) was the only political party in Burma. There was no organized opposition owing to
restrictive laws, tight government control of all mass media, and the influence of security and party operatives in all sectors of society. Burma's civil administration was delegated to a number of people's councils.

Policy

After 1962, the Burma Socialist Program Party attempted thoroughly and radically to transform Burmese society under a program called the "Burmese Way to Socialism." All means of production -- agriculture, industry, external trade and distribution -- must be owned by the State. Every citizen must have equal opportunity according to his or her physical and mental ability. The government nationalized all foreign and private banks, industries, factories, and stores -- nearly all private economic enterprises. The government ran all sectors, including production and distribution systems, through government or cooperative agencies. The main policy of the Revolutionary Government was to suppress private enterprise and isolate the country from the outside world. Economic policy also emphasized self-reliant development and industrialization. The main objectives of economic policy were 1) to eliminate foreign economic control; 2) to reduce dependence on foreign markets; 3) to diversify industry and; 4) to centralize state power to eliminate private. However, the foreign policy of the Revolutionary Government was to keep cordial and proper relations with all nations, and neutrality in world affairs.
**Economy**

Burma's policy of economic self-sufficiency and isolationism after 1962 had effectively limited its participation in world markets to a few primary-product exports, especially teak, jade, and other precious gems. The mainstay of the Burmese economy was agriculture. To try to increase agricultural production, the new government introduced land tenure reform and eliminated the landlord system in 1964. According to new law, all lands in Burma were to be owned by the State, but the farmers have the right to cultivate. They may occupy the land, regardless of farm size as long as they were engaged in farming. The land can be used for agricultural purposes by family members (sons or daughters) after the death of parents or the head of the household. Private tenancy was illegal, and land cannot be sold or bought by individuals. Therefore, most agricultural land was effectively controlled by independent small holders.

In 1965-66, the government established a urea fertilizer plant with Soviet aid, a power tiller and diesel water suction pump factory with Japanese cooperation, and a tractor plant with Czechoslovakian help. The government distributed agricultural loans to farmers every year at a flat rate per acre to help them cultivate important crops according to the national agricultural production plans. The long term national economic plan initiated in 1974-75 will end in 1993-94. There were two objectives in the long term plan: 1) to raise the people's living standard twofold by the end of the term, and; 2) to
make the Burmese economy into an industrialized economy. Table 3 shows by sector in 1961-62 vs. 1984-85.

Table 3
Proportion of Gross Domestic Products by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Fiscal Year</th>
<th>1961 - 1962</th>
<th>1984 - 1985</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>35.7%</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>7.4%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>3.0%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td>1.6%</td>
<td>3%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Asia Year Book, 1963 and 1985

Agriculture still dominates the domestic economy, and also accounted for an average of 47% of GNP (vs. 11% for industry) in the 1979-83 years (Asia Yearbook 1985). Agriculture employed 64% of the national work force (vs. 8% for industry) in 1984-85 (Asia Yearbook 1985).

The industrial sector, accounting for 10% of GDP, performed poorly in the 1970s. The sector faced several problems such as technical bottlenecks, lack of foreign exchange for imported raw materials or spare parts, and managerial constraints. Certain assembly industries continue to operate at low capacity, mainly because of their extreme dependence upon imported components.

Offshore oil exploration was not successful, although it has high potential.
The transport sector was operated by the State. The four principal carriers in the country were the state-managed Burma Railways (BR), Inland Waterways Transport (IWT), Union of Burma Airways (UBA) and Road Transport Corporation (RTC). Transport services have been a major problem. Transport bottlenecks impeded production and distribution in many areas. Essential agricultural inputs such as fertilizers, seed, and diesel fuel (in addition to consumer goods) have often been in short supply because of transport difficulties. Movement of agricultural produce was handicapped for want of adequate transportation. Generally, government transport agencies have been unable to cope with the increasing demand for commercial and passenger services.

**Crop Production**

Burma was rich in agricultural resources including arable land, natural streams and rivers, very fertile soils in the lower part of the country, and natural gas and rock phosphates for fertilizer production. These resources, however, have not yet been fully exploited for agricultural production. At present, yields of crops are low compared to other Asian countries (Table 4) because of inadequate investment in the agricultural sector and lack of technological improvement.
Table 4

Crop Yields in 1986 (kg/ha)

<table>
<thead>
<tr>
<th></th>
<th>Paddy</th>
<th>Corn</th>
<th>Wheat</th>
<th>Peanut</th>
<th>Soybean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burma</td>
<td>3028</td>
<td>1716</td>
<td>1892</td>
<td>1076</td>
<td>815</td>
</tr>
<tr>
<td>Thailand</td>
<td>2052</td>
<td>3246</td>
<td>2032</td>
<td>1424</td>
<td>1340</td>
</tr>
<tr>
<td>Japan</td>
<td>6322</td>
<td>2590</td>
<td>3567</td>
<td>1918</td>
<td>1772</td>
</tr>
<tr>
<td>China</td>
<td>5372</td>
<td>3411</td>
<td>2997</td>
<td>1712</td>
<td>1336</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3979</td>
<td>1893</td>
<td>----</td>
<td>1552</td>
<td>1027</td>
</tr>
<tr>
<td>U.S.</td>
<td>6334</td>
<td>7487</td>
<td>2317</td>
<td>2699</td>
<td>2238</td>
</tr>
</tbody>
</table>


**Fertilizer Use and Mechanization**

Although current crop yields are low, Burma has the potential to increase production substantially with proper irrigation, adequate supplies of inputs such as chemical fertilizers and hybrid seeds, and strengthened institutions. Fertilizer use was low compared to other Asian countries (Table 5). Urea fertilizer was produced in Burma, amounts were not sufficient, even for paddy crops alone. Phosphate and potash fertilizers must presently be imported but amounts were low by lack of foreign exchange. Mechanization was proceeding slowly under the government tractor services, supplemented by a small cooperative sector.
Table 5
Fertilizer Use Per Cropped Hectare in 1985 (kg/ha)

<table>
<thead>
<tr>
<th>Country</th>
<th>Fertilizer Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burma</td>
<td>19</td>
</tr>
<tr>
<td>Thailand</td>
<td>21</td>
</tr>
<tr>
<td>Philippines</td>
<td>31</td>
</tr>
<tr>
<td>Indonesia</td>
<td>60</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>74</td>
</tr>
<tr>
<td>China</td>
<td>44</td>
</tr>
<tr>
<td>Japan</td>
<td>430</td>
</tr>
</tbody>
</table>

Source: FAO (1987)

Agricultural Producers

According to government policy, cooperative and state farm sectors as well as smallholders were to be involved in agricultural production. Government-establishd state farms and cooperative farms according to the 20 year plan, should produce 10% and 50% respectively, of total agricultural production by 1993-94. (The remaining 40% would be produced by individual smallholders). However, state and cooperative farms have not been very productive. People assigned to these farms were not committed to production or their work. Most of them were inexperienced in farm management. There were problems of social integration among workers with different
backgrounds. Most farms did not have adequate inputs, facilities, and staff to implement production plans, which were generally unrealistic.

The overall agricultural sector, performed poorly until the early 1970s. In general, production was low because of insufficient public and private investment in agriculture, inadequate production incentives, shortages of inputs (especially fertilizers) and a technological inability to exploit the available land and water resources. The Irrawaddy and Chindwin rivers drain about 60% of national territory and their mean annual flow was about twice that of the Ganges, or four times that of the Nile. Only a small proportion of this water resource was currently used for irrigation.

Most agricultural plans were drawn at top management levels without participation by producers, need assessments or situational analyses. Production targets were usually set to meet national requirements regardless of existing constraints, particularly a shortage of agricultural inputs. The long term objective of doubling the standard of living in Burma (by 1993-94) through an increase in agricultural production will not be achieved because of many factors -- especially inadequate investment and the weakness of agricultural extension systems.

**Marketing System**

Within the Burmese economy, two marketing systems have emerged, the official government-controlled market and a free black market. Shortages of consumer goods at government run stores led to a rapid
growth of the black market. The black market in Burma has also grown to accommodate elements of the economy not controlled under the government's monopoly purchase system for agricultural commodities and official prices for retail goods. In this mixed economy, both government and free market prices prevailed for most goods. Most consumer goods could be purchased on the black market, but were rather expensive. Table 6 shows some sample prices prevailing in the official and black markets in March 1988.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Unit</th>
<th>Government Price</th>
<th>Free Market Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy (Lower Burma)</td>
<td>Basket (46 lb)</td>
<td>10.90</td>
<td>16</td>
</tr>
<tr>
<td>Paddy (Upper Burma)</td>
<td>Basket (46 lb)</td>
<td>10.90</td>
<td>25</td>
</tr>
<tr>
<td>Wheat</td>
<td>Basket (72 lb)</td>
<td>70</td>
<td>60–250</td>
</tr>
<tr>
<td>Maize</td>
<td>Basket (55 lb)</td>
<td>20</td>
<td>30–40</td>
</tr>
<tr>
<td>Peanut</td>
<td>Basket (25 lb)</td>
<td>45</td>
<td>65–120</td>
</tr>
<tr>
<td>Sesame</td>
<td>Basket (54 lb)</td>
<td>160</td>
<td>200–350</td>
</tr>
<tr>
<td>Sunflower</td>
<td>Basket (32 lb)</td>
<td>65</td>
<td>80–100</td>
</tr>
<tr>
<td>Blackgram</td>
<td>Basket (69 lb)</td>
<td>40</td>
<td>80–100</td>
</tr>
</tbody>
</table>

Source: USAID (1988)
Recent Policy Changes

By government policy, most foreign aid programs in Burma stopped after 1962. Faced with the unsatisfactory performance and economic difficulties resulting from this policy, the government made some limited changes after 1972. Multilateral and bilateral foreign aid was again encouraged. More investments were made in agriculture, especially for high yielding crops. Agricultural growth increased and contributed to growth in GDP to some extent.

The government demonetized in 1964, 1986 and 1987. The main objective was to stop hoarding and to damage the black market. The last round, in September 1987, destroyed the savings of many people when the government reduced the value of its highest banknotes to zero.

In August 1987, U Ne Win, Chair of the Burma Socialist Program Party suggested some adjustments to improve the economic situation of the country. Restrictions on private sector participation in the trade in rice and other foods were lifted to improve marketing and distribution, and to increase production. In February 1988, the government monopoly on rice exports was removed but no private exports were forthcoming because foreign exchange was kept under control of the government. Unrealistic exchange rates and cumbersome bureaucratic procedures also acted to prevent private exports.

In July 1988, there was an extraordinary Party Congress. During this meeting, Party Chair, U Ne Win suggested changes in economic policy and asked the Party Congress to hold a national referendum on whether the people wanted a one-party or multi-party system. He then
resigned as Party Chair. The Party Congress rejected U Ne Win's proposal for multi-party systems and elected former Brigadier General U Sein Lwin as Party Chair and President. Demonstrations initiated mostly by students and Buddhist monks soon followed. They demanded democracy and a multi-party system because of economic crisis. Political turmoil ensued and General Saw Maung took power on September 18, 1988. His government (State Law and Order Restoration Council) promised that free and fair elections for multi-party systems would be held at the appropriate time (May 1990 was expected).

The Burmese Agricultural Extension System

At the national level, Burma's Ministry of Agriculture and Forests was in overall charge of agricultural development plans. Various department and equivalent corporations, including the Agriculture Corporation, were arranged under the Deputy Minister for Agriculture (Figure 1). Animal production was separately organized under the Ministry of Livestock Breeding and Fisheries. Departments and corporations were headed by a Director-General or Managing Director. The main functions of the Agriculture Corporation were as follows:

1) implement agricultural plans as approved by the Ministry,
2) educate farmers in improved techniques of cultivation, disease, and pest control,
3) conduct research on the problems of soil and crop management,
4) develop suitable high yielding varieties,
5) produce high-quality seeds for distribution
6) classify soils and advise on soil conservation
7) procure and distribute of agrochemicals (Burma, 1976, p. 21).

These functions were carried out by the Managing Director with the assistance of General Managers in each division, (Figure 1). The work of the Agriculture Corporation's divisions (excluding Administration, Accounts, and Plantation Crops) was described below.

Figure 1. Organizational Chart of the Burmese Agricultural Ministry and Extension
Agricultural Research Institute

The Agricultural Research Institute (ARI) was the only agricultural research center in Burma. In addition to already established subdivisions: (Agronomy, Botany, Soil and Agricultural Chemistry, Plant Pathology and Entomology), crop subdivisions were established in 1974 for 1) rice, 2) maize and other grains, 3) fibre crops (jute and cotton), 4) oil seeds, 5) pulses, 6) sugarcane, and 7) horticulture. Research work at ARI was aimed at increasing crop production by way of high-quality seeds, improved crop husbandry and plant protection techniques, more efficient application methods of plant nutrients and better cropping systems suited to agro-ecological conditions.

Regional Research Division

The Regional Research or Outreach Research Division administers 16 central agricultural experiment stations, most of them established by the British colonial government; 54 sub-stations are located in different climatic and soil areas of the country. The results from research programs in ARI are passed on to the relevant central agricultural experiment stations for further testing under regional conditions. The experiment stations are also responsible for solving simple agricultural problems in the region they serve. Their main functions are regional testing; production of nucleus and foundation
seed stock of improved crop varieties; and training of village level extension agents, farm youths and small farmers in improved methods of agriculture.

**Land Use Division**

This division was responsible for preparing land use maps. It coordinates research activities with related agencies for the purpose of introducing soil conservation and land improvement practices. It also evaluates soil fertility and experiments with fertilizer use and soil management practices.

**Project Planning and Evaluation Division**

This division was established in 1978 to coordinate work among other division of the Agriculture Corporation and other government agencies. It's main functions are to draw agricultural plans in coordination with the Ministry of National Planning, and to negotiate with foreign agencies to obtain technical and financial assistance for agricultural development projects. Most, agricultural projects are production-oriented; they aim at improving yields and increasing production. This division monitors and evaluates project activities and reports to the ministry and donor agencies concerned. In practice, however, monitoring and evaluation by this division was often inadequate.
Procurement and Distribution Division

This division procures and distributes all chemical fertilizers, insecticides, fungicides, herbicides, etc. It also coordinates this work with other agencies to ensure the timely distribution of agrochemicals on time as it was the only agency in Burma for importing and distributing agrochemicals.

Agricultural Extension Division

The extension division was mainly advisory, transmitting the experimental findings of and the Regional Research Stations to farmers. The major functions of the Extension Division were:

1) Implement the annual production-oriented agricultural plan set by the Ministry of National Planning under the guidance of the Burma Socialist Program Party.
2) Distribute of input supplies to the farmers in coordination with other departments and corporations
3) Distribute quality seed in coordination with the research division.
4) Provide extension education to farmers
5) Encourage farmers to expand cropping area.

To carry out these functions the extension division was assisted by:

1) State or Divisional Managers at the State/Divisional level
2) Township Managers at the township level
3) Village Tract and Village Managers at the village level.
A village extension worker takes charge of a village tract or village with 3,000 to 6,000 acres of crop land depending on the locality, while a Village Tract Manager supervises the work of ten village managers who are in direct contact with the farmers. The latter are the "front line workers."

In Burma, there are 14 states and divisions (equivalent to state level in the US), 314 townships (equivalent to county level in the US), and 12,478 village tracts comprising 5 to 10 villages for the purpose of local administration. States are areas where a national ethnic minority was the local majority group. There are seven such states: Chin, Kachin, Karen, Kayah, Mon, Rahkhine and Shan. The divisions, seven in number, are areas with a Burman majority: Irrawaddy, Magwe, Mandalay, Pegu, Sagaing, Rangoon and Tenasserim (Appendix A).

**Extension Staff and Qualification.** All administrators are graduates in management or other arts and science subjects. All state and divisional managers have B.S. degrees in agriculture. Most of the township managers are graduates of the Institute of Agriculture, the only agricultural institution at the university level under the Ministry of Education in Burma. Village level extension workers are generally junior college, or vocational agriculture, or agricultural high school graduates. There were 24,056 staff members of the Agriculture Corporation in 1988 with almost one-third of them in the Extension Division (Table 7).
Table 7
Staff for Divisions
Of the Agriculture Corporation (1988)

<table>
<thead>
<tr>
<th>Divisions</th>
<th>Officers</th>
<th>Other Ranks</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>18</td>
<td>996</td>
<td>1,014</td>
</tr>
<tr>
<td>Project P&amp;E</td>
<td>8</td>
<td>68</td>
<td>76</td>
</tr>
<tr>
<td>Extension</td>
<td>225</td>
<td>7,202</td>
<td>7,427</td>
</tr>
<tr>
<td>Procurement &amp; Distribution</td>
<td>26</td>
<td>11,076</td>
<td>11,102</td>
</tr>
<tr>
<td>Plantation Crops</td>
<td>10</td>
<td>2,050</td>
<td>2,060</td>
</tr>
<tr>
<td>Accounts</td>
<td>18</td>
<td>363</td>
<td>381</td>
</tr>
<tr>
<td>Regional Research</td>
<td>28</td>
<td>1,465</td>
<td>1,493</td>
</tr>
<tr>
<td>Agri-Res Institute</td>
<td>27</td>
<td>299</td>
<td>326</td>
</tr>
<tr>
<td>Land Use</td>
<td>7</td>
<td>170</td>
<td>177</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>367</strong></td>
<td><strong>23,689</strong></td>
<td><strong>24,056</strong></td>
</tr>
</tbody>
</table>

Source: Agriculture Corporation, Rangoon, Burma. *Total Staff includes clerical and temporary assigned positions.

Extension Program Delivery Methods

Burmese extension serves only agricultural producers (farmers) as it was only concerned with crop production. Special agricultural educational programs are delivered by the Agricultural Information and Educational Program Section under the Extension Division. The staff of this section spread information through leaflets, newsletters, pamphlets, and radio programs about agricultural technology developed by researchers. The number of staff for this section was very
limited. At present there is only one officer and a few clerical
staff to serve the whole country.

Under the Burmese extension system the Village Managers (Village
Extension Workers) are "front line" workers. They are responsible for
organizing and educating farmers to increase crop production by both
extensive and intensive methods of cultivation. In order to increase
the yield per acre, village managers closely supervised and guide the
farmers in the application of scientific agricultural methods. The
extension methods used to teach farmers include farm/home visits,
demonstrations, field days, group meetings, discussions and
distribution of a limited amount of printed materials. The most
commonly used method was "result demonstration." This was a very
effective method as many farmers can be convinced to adopt improved
practices showing them actual results of such techniques as high
yielding varieties, fertilization, better tillage, or pesticide
application. Demonstrations or field days can also be carried out at
regional agricultural experiment stations as well as farmers land.

In Burma, mass media exposure was very low among rural farmers.
At present, there is only one radio station in the country. It is
located in Rangoon and can reach only a limited area. Most rural
people who own radios are generally tuned to music rather than to
information about agriculture. At present, there is only one
government-run newspaper circulated in the country. All mass media
are under the government control. Farmers rarely subscribe to
newspapers or magazines. There are no regular scientific publications in the country. Thus, sources of technological information are limited for both extension workers and farmers. Most extension workers teach by lecture methods because they have not been trained in other teaching principles. The Burmese extension system did not have proactive extension educational programs set on the basis of clienteles' needs. However, the Agriculture Corporation formulated a new extension program in 1976, known as the "selective concentrative strategy" for rice production. As a result of its success in rice production, this new strategy has now been applied to all important crops. It has the following five components:

1) **Application of proven technology**: local and international research results are assembled, and an appropriate and proven technologies such as high-yielding varieties, etc. are introduced to the farmers.

2) **Government support and leadership**: The Burma Socialist Program Party provides political leadership and all agricultural plans are implemented under the guidance of the Burma Socialist Program Party, with the supervision of the People's Council and the coordination and cooperation of the peasants' organization and other government agencies at various levels.
3) **Selectivity and concentration**: "Selectivity" comes in terms of locality, variety of crops, extension personnel and management. The program is introduced only after this selection has been made and concentrated efforts are given to the program area.

4) **Mass participation**: The new strategy for rice production requires precise timing of plowing, harrowing and transplanting, which are accomplished through collective effort. Non-farm workers or people not related to the agricultural sector, such as police or army personnel, are involved in the agricultural production programs. They contribute their labor for activities such as plowing, harrowing, transplanting, harvesting, construction of dams or drainage systems, etc.

5) **Competition**: Farmers are encouraged to compete with each other for highest yield. The government offers winners prizes, ranging from money and farm machinery to honorary certificates. The outstanding farmers are given recognition by the government.

**Agricultural Education.** Education in Burma on all levels is a state function, and it is centralized under the Ministry of Education. The first college of agriculture was opened in 1924 under the Director of Agriculture in the Ministry of Agriculture. It became a constituent
college of the University of Rangoon and was then attached to Mandalay University in 1958 (Unesco, 1971). With the enactment of the University Education Law of 1964, a new Institute of Agriculture was founded. This was the only agricultural institution at the university level in Burma. According to the 1964 Education Law, the Burmese language became the essential medium of instruction for all levels of education. The law laid down the following aims and objectives of curricular programs (UNESCO 1971):

* To produce technicians who will participate in building Burmese Socialism.

* To produce scholars capable of promoting a socialist economy and social welfare.

* To give priority to the teaching of vocational arts and sciences that will help the students to acquire an effective means of livelihood.

* To carry out research work that will contribute to the success of socialist construction.

* To train students to be fully imbued with socialist morality.

* To train them to uphold the value of labor.

* To take measures that will ensure a constant advancement in the knowledge and skill of the working people who are engaged in the construction of socialism.

A separate Agricultural Education department or Agricultural Extension/Communication department has not yet been established at the
Institute of Agriculture. In addition to the Institute, there are two junior colleges of agriculture and 13 agricultural high schools (Table 8).

Table 8
Agricultural Educational Institutions in Burma

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th>Total Number</th>
<th>Annual Average No. Of Grads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute of Agriculture (5 Years) (University level/undergraduates only)</td>
<td>1</td>
<td>196</td>
</tr>
<tr>
<td>Junior College of Agriculture (2yrs) (State Agricultural Institute)</td>
<td>2</td>
<td>138</td>
</tr>
<tr>
<td>Agricultural High Schools</td>
<td>13</td>
<td>561</td>
</tr>
</tbody>
</table>


Funding. The only source of funding for agricultural extension was the financing of the Agricultural Corporation, which was provided by the central government. All expenditures such as salaries, allowances, operating costs and capital investments were allocated yearly by the government. There was no funding from the private sector.

An Analysis of the Burmese Extension System Using Specific Criteria Research and Extension Linkage. In Burma, there was no association between the agricultural extension division and the Institute of
Agriculture or agricultural colleges in respect to research or other related areas. Agricultural extension was under the auspices of the Ministry of Agriculture, while all institutions of agricultural education were under the Ministry of Education. The lack of a link between extension fieldwork and agricultural education was one of the limitations of the Burmese extension system.

For any extension system to be effective, it needs continuous access to improved technology and additional technological support when problems arise. Although there were research divisions within the Agriculture Corporation, Burma has relatively little agricultural research capacity or ability for indigenous development of new farm technologies because: 1) most agricultural research stations did not have well qualified persons to perform research work; 2) trained researchers usually occupy administrative positions rather than research posts, (for instance, one Burmese research scientist holding a doctorate in plant pathology has been assigned to customs clearance of foreign-project commodities); 3) most agricultural research stations were concerned with improving existing varieties, farm practices, fertilization methods, and seed production rather than developing new techniques; 4) no resource persons or technical support from agricultural university or colleges were available for research or extension activities; and 5) there was no real link with many international agricultural research centers. Burma needs an increase in crop productivity. If the Burmese extension system were to have a
good external linkage with international agricultural research centers through research workers, it would be much easier for the country to borrow externally developed technology that could be modified to suit Burmese conditions. This adaptation and modification of technology was more efficient in terms of time and money than developing a new technology. However, the isolation policy and bureaucratic procedures of the last two decades have meant that Burma has only a very weak tie to the international agricultural research centers. At present, research and extension do not interact closely enough to have a significant effect on production. In some cases, extension staff at township or village levels lacked contact with research staffs at agricultural research stations. With this researcher's personal experience, the two research divisions themselves (ARI and the regional experiment stations) sometimes lacked coordination and cooperation. Plans of research were generally drawn up separately for research and extension divisions so that timing and priorities do not coincide. There was also much duplication of work between ARI and the regional research stations.

Nevertheless, the overall linkage between research and extension in the Burmese system can be rated as moderately strong because research and extension divisions were established under the same organization, the Agriculture Corporation. The following information
from an FAO survey (1988) provides a general overview of the nature and extent of the research/extension contact during 1987–88:

<table>
<thead>
<tr>
<th>Type of Contact</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research papers received by extension</td>
<td>30</td>
</tr>
<tr>
<td>Technical reports received by extension</td>
<td>14</td>
</tr>
<tr>
<td>Extension type bulletins and circulars prepared for use by extension</td>
<td>10</td>
</tr>
<tr>
<td>Workshops/training sessions given by research to extension personnel on a new technology</td>
<td>26</td>
</tr>
<tr>
<td>Joint on-farm trials/demonstrations conducted by research and extension personnel</td>
<td>100/60</td>
</tr>
<tr>
<td>Joint research-extension field days conducted</td>
<td>20</td>
</tr>
<tr>
<td>Joint planning meetings between research and extension to develop technical recommendations for farmers</td>
<td>2</td>
</tr>
</tbody>
</table>

Adequate Financial Resources. According to the Burma Socialist Program Party's economic policy, the industrial sector has priority for investments for national economic development, even though the
agricultural sector was the economic mainstay of the country. Prior to 1962, the industrial sector was almost completely agro-based -- jute, sugar, and textile mills, etc. -- and the greatest share of public investment was made for agricultural sector (Table 9). During the 1960s, the government sought to establish basic industries oriented toward import substitutions rather than agro-based production. Scarce investment resources including foreign exchange flows, went primarily to these industries rather than the agricultural sector (Table 9).

Table 9

Percentage Allocation of Public Capital Expenditures

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>11.1</td>
<td>8.8</td>
<td>16.1</td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>1.8</td>
<td>2.0</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>4.9</td>
<td>29.3</td>
<td>34.7</td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td>.3</td>
<td>5.4</td>
<td>11.2</td>
<td></td>
</tr>
</tbody>
</table>

Source: Asia Yearbook (1963 and 1985).

Inadequate government commitment to the agricultural sector hindered its performance and, consequently, national economic growth. Bunge (1983:138) wrote:

Economic growth during the 1960s was slow and erratic, the nation's GDP barely kept pace with population growth. Per capita food production, especially that of the important rice crop, declined substantially after 1964 and did not recover until well into the next decade. Despite the emphasis of public investment on industry, manufacturing output grew even more slowly than
Looking back on the poor performance of the past, the Burma Socialist Program Party catalogued numerous problems. Foremost was the neglect of agriculture, forestry, fishing, and mining, where most of the national wealth was concentrated, and the failure to develop consumer goods and exports based on these resources.

The government made proportionately greater investments in the agricultural sector after 1976, concurrent with the promotion of high yielding varieties of rice and accompanying chemical fertilizers. In 1977 the government launched the Whole Township Extension Program for rice production in 72 major rice-producing townships, and again began to accept financial and technical assistance from bilateral and multilateral sources. Chemical fertilizers were supplied by agricultural development projects from the governments of the United States, Japan, and the Federal Republic of Germany. The result of these changes was a significant upturn in the rate of economic growth from 1976 onward. Table 10 shows government investment in the entire agricultural sector as a percent of total government recurrent expenditures; and Table 11 shows government recurrent expenditures for agricultural extension. The average annual allotment of recurrent expenditure for agricultural extension was about 12 percent of that for the total agricultural sector (i.e., 11.6% in 1980 and 11.8% in 1985). These data indicate that the government has made a greater financial commitment to the agricultural sector and to extension services since the late 1970s.
Table 10

Recurrent Expenditures (Kyat Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Government Expenditures</th>
<th>Agricultural Sectors (Ministry)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>3533</td>
<td>446</td>
<td>12.6</td>
</tr>
<tr>
<td>1977</td>
<td>4147</td>
<td>713</td>
<td>17.2</td>
</tr>
<tr>
<td>1978</td>
<td>4787</td>
<td>983</td>
<td>20.6</td>
</tr>
<tr>
<td>1979</td>
<td>5194</td>
<td>1049</td>
<td>20.2</td>
</tr>
<tr>
<td>1980</td>
<td>6119</td>
<td>1442</td>
<td>23.6</td>
</tr>
<tr>
<td>1981</td>
<td>7046</td>
<td>1841</td>
<td>26.1</td>
</tr>
<tr>
<td>1982</td>
<td>7898</td>
<td>2033</td>
<td>25.7</td>
</tr>
<tr>
<td>1983</td>
<td>7936</td>
<td>1771</td>
<td>22.3</td>
</tr>
<tr>
<td>1984</td>
<td>8509</td>
<td>2162</td>
<td>25.4</td>
</tr>
<tr>
<td>1985</td>
<td>9015</td>
<td>2213</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Table 11
Recurrent Expenditure for Agricultural Extension (Kyat Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>17.8</td>
</tr>
<tr>
<td>1965</td>
<td>17.8</td>
</tr>
<tr>
<td>1970</td>
<td>17.8</td>
</tr>
<tr>
<td>1975</td>
<td>38.2</td>
</tr>
<tr>
<td>1980</td>
<td>167.3</td>
</tr>
<tr>
<td>1985</td>
<td>261.6</td>
</tr>
<tr>
<td>1986</td>
<td>338.3</td>
</tr>
<tr>
<td>1987</td>
<td>330.4</td>
</tr>
<tr>
<td>1988</td>
<td>275.5</td>
</tr>
</tbody>
</table>


Table 12 shows the growth of GDP for selected periods, and Table 13 shows the average annual growth rate in the agricultural sector (excluding forestry and livestock). More investment on chemical fertilizers and high yielding varieties of seed along with a new extension strategy, i.e., "selective concentration" has apparently promoted higher growth rates in both GDP and crop farming.
Table 12
Growth of Gross Domestic Product
(Average Percentage Change per Year)

<table>
<thead>
<tr>
<th>Period</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962-70</td>
<td>3.1</td>
</tr>
<tr>
<td>1971-74</td>
<td>2.0</td>
</tr>
<tr>
<td>1974-77</td>
<td>4.7</td>
</tr>
<tr>
<td>1978-81</td>
<td>6.6</td>
</tr>
</tbody>
</table>


Table 13
Average Annual Growth Rate of Crop Farming

<table>
<thead>
<tr>
<th>Period</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962-70</td>
<td>3.7</td>
</tr>
<tr>
<td>1971-74</td>
<td>2.7</td>
</tr>
<tr>
<td>1974-77</td>
<td>3.6</td>
</tr>
<tr>
<td>1978-81</td>
<td>8.7</td>
</tr>
</tbody>
</table>


The data in Table 10-13 demonstrate that an adequate government financial commitment to Burma's agricultural sector has been accompanied by an increase in economic growth. However, funding was still a critical issue for the Agriculture Corporation, particularly for research and extension activities because as there were no private
sources of investment or support for agricultural programs. Low budgetary commitments to agricultural research in particular, made it difficult to extend past progress to immediate and future agricultural problems. Recurrent expenditures for agricultural research in Burma in 1988 were only 64.16 million kyats, about 4.6 percent of the total for the Agriculture Corporation (Table 14).

<table>
<thead>
<tr>
<th>Functional Unit</th>
<th>Allotment (Kyat Millions)</th>
<th>Percentage of Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Corporation</td>
<td>1392.17</td>
<td>----</td>
</tr>
<tr>
<td>Extension Division</td>
<td>275.56</td>
<td>19.8</td>
</tr>
<tr>
<td>Research Division</td>
<td>64.16</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Source: FAO (1988)

**Adequate Human Resources.** Human resources were critical to the process of disseminating information about agricultural technology from researcher to farmer, and for reporting farmer feedback to researchers. An extension system should have an appropriate extension agent/farm family ratio. In Burma, the total number of professional and technical staff in extension in 1986 was 5,511 (FAO 1988) and the total number of peasant families was 4.3 million (Report to the Pyithu Hluttaw for 1987/88, Burma), for an extension agent/farm family ratio of 1:780. Burma's ratio was in line with the 1:800 recommended by
Benor et al. (1984), but in terms of the capacity of extension field workers to address cropland acreage, Burma's extension staff was not strong enough to supervise and guide farmers in the application of scientific agricultural methods. The average sown acreage supervised by a village manager in 1988 was 4354 acres (Burma, 1988). It was not easy for a village manager to supervise such a large area because communications were poor (there were no telephones at the village level) and transportation was difficult.

In the Burmese extension system, the number of subject matter specialists was very limited. Numbers of extension personnels in 1988 by function and program area were shown in Table 15.

### Table 15

<table>
<thead>
<tr>
<th>Function/Program Area</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrators/supervisors</td>
<td>328</td>
</tr>
<tr>
<td>Extension specialists</td>
<td></td>
</tr>
<tr>
<td>(a) Technical/subject matter specialists</td>
<td>6</td>
</tr>
<tr>
<td>(b) Agricultural information specialists</td>
<td>1</td>
</tr>
<tr>
<td>(c) Training specialists</td>
<td>7</td>
</tr>
<tr>
<td>Subtotal specialists</td>
<td>14</td>
</tr>
<tr>
<td>Field extension officers/assistants</td>
<td></td>
</tr>
<tr>
<td>(a) Agricultural area</td>
<td>5326</td>
</tr>
<tr>
<td>(b) Home economics</td>
<td>-</td>
</tr>
<tr>
<td>(c) Rural youth extensionist</td>
<td>-</td>
</tr>
<tr>
<td>(d) Other areas</td>
<td>-</td>
</tr>
<tr>
<td>Total number of extension staff</td>
<td>5668</td>
</tr>
</tbody>
</table>

Source: FAO (1988)
The number of subject matter specialists as a percentage of total staff was extremely low, only 0.25 percent; Latin American countries have 13 percent (Swanson et al. 1988).

The qualifications of extension personnel were also very important to an effective extension system. The inability of field extension workers (village managers in Burma) to obtain appropriate technical expertise can be an important constraint. The level of education and training of most Burmese field extension workers was relatively low. Table 16 shows educational qualifications of professional and technical extension personnel in the Burmese extension system.

Table 16
Educational Qualification of Field Extension Personnel (1988)

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than secondary school</td>
<td>2697</td>
</tr>
<tr>
<td>Secondary school or equivalent</td>
<td>1025</td>
</tr>
<tr>
<td>Intermediate level (diploma)</td>
<td>865</td>
</tr>
<tr>
<td>University graduate (B.S.) or equivalent</td>
<td>729</td>
</tr>
<tr>
<td>Postgraduate degree (M.S. or PhD)</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>5326</strong></td>
</tr>
</tbody>
</table>

Source: FAO (1988)

Another aspect of personnel resources concerns the personnel management procedures that were regularly used in the organization.
At present, the Burmese extension system has no systematically written and distributed evaluation procedures and criteria. No written personnel manual was available to extension supervisors. Immediate superiors usually send a recommendation and performance appraisal to higher authorities when a subordinate was about to be promoted, but there was no regular evaluation of performance of each extension staff member. It was very difficult for a state/divisional or township manager to appraise the work of village managers assigned to remote areas.

**Program Development Procedures.** The main purpose of agricultural extension was to educate farmers. The development of an educational program with the people's involvement was very important. Systematic planning was essential to increase the effectiveness of extension organizations. This planning requires clear decisions about what kind of changes the extension organization was trying to achieve among farmers, and how these changes will be achieved. This planning must be based on careful analysis of past extension experiences and the reasons why these changes have or have not been achieved. Careful evaluation of objectives, methods and results was an integral part of effective extension program planning.

All extension programs in Burma were top-down efforts oriented to crop production targets. Systematic program development procedures have not yet been established. According to the researcher's personal
experience, most extension programs were not based on assessments of the needs and interests of farmers. Agricultural production plans were drawn by higher level management without the participation of the extension clientele or consideration of available resources and agricultural inputs.

A top-down style of planning production goals and extension programs was prone to include political objectives (e.g., promotion of export crops to raise governmental flows of foreign-exchange earnings) and unrealistic targets, sometimes at the expense of farmers' income. In such situations, extension workers were apt to lose the confidence of their clientele. In an educational sense, farmers gain little in terms of production skills and decision-making abilities that would boost future production possibilities. The Burmese extension system did not have committees such as extension advisory committees or other program development procedures that would provide feedback from its clientele.

Extension Delivery Methods. The Burmese extension system relied primarily on group activities to deliver education. Mass media exposure was very low among rural peasants. Although mass media methods such as posters, pamphlets, leaflets, and exhibits at fairs were relatively common; there was little opportunity to employ television, radio or newspapers in a country with only one limited-range radio station and one limited-circulation newspaper.
Table 17 shows the rank order of priority that the Burmese extension program gives to "individual," "group" and "mass media" activities, and the relative allocation of extension resources to each type of activity.

Table 17

<table>
<thead>
<tr>
<th>Educational Activity</th>
<th>Rank Order</th>
<th>Relative Allocation of Extension Resources (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual methods</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Group activities</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>Mass media activities</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: FAO (1988)

Individual methods involved face-to-face contact between an extension field worker and a client. In Burma, all village managers were extension field workers assigned to work with rural small farmers. Such individual methods were useful and important but reached an audience of one at a relatively high cost in resources (i.e., time). Group activities such as demonstrations, field days, group meetings and training courses at research stations reached a larger clientele (and so rank first) at a similar allocation of resources.
The number of farm/home visits made annually by an extension agent was one way to evaluate the contacts of an extension agent and the probability of technological education having taken place. Roger (1983) stated that the more often extension agents made contact with their clientele, the more likely it was that the clientele would be satisfied with extension services. Interpersonal communication with the clientele was crucial to extension education. Table 18 shows the extension activities completed each year by a typical field extension officer in Burma.

Table 18
Individual Extension Activities in Burma

<table>
<thead>
<tr>
<th>Individual Activities</th>
<th>Average Number Completed Annually Per Officer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual farm/home visits</td>
<td>200</td>
</tr>
<tr>
<td>Office visits by clients</td>
<td>110</td>
</tr>
<tr>
<td>Group educational meetings</td>
<td>8</td>
</tr>
<tr>
<td>On-farm demonstrations</td>
<td>2</td>
</tr>
<tr>
<td>Farmer field days</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: FAO (1988)

Ekpere (1974) reported that 100 or more farm/home visits each year by an extension agent was a "high" level of individual contact. By this standard, the Burmese extension service was excellent in terms of
number of contacts (Table 18). However, the effectiveness and purpose of visits were more important than numbers. In this regard, the researcher felt that many visits by village managers were non-educational visits. The high number of client visits to extension offices (Table 18) may also be somewhat misleading. In Burma, most peasants come to the extension office to obtain agricultural inputs (seeds, fertilizers and pesticides) rather than technical advice.

As a source of information on agricultural technology, on-farm demonstration was probably the most effective and applicable method in Burma, but the average number of on-farm demonstrations held by extension field officers per year was only two. It should be possible to organize more than two demonstrations in a year, and so make better use of this effective method.

The Agriculture Corporation sponsored 21 farm training courses/workshops for local farmers in 1987 (FAO 1988) but these were usually given at and by research stations rather than extension agents; much the same applies to farmer field days (28 in 1987), group tours (28), and farm contests (22).

Although radio offered high potential in transmitting technological information for rural small farmers, the number of radio broadcasts by Burmese extension was only 104 in 1987, with 10 minutes per broadcast (FAO 1988). As noted, conventional radio broadcast can reach only limited areas from the one radio station in Rangoon, and only a few small farmers owned radios. In 1982 there were an
estimated 805,000 radios in the country, or 22 per 1000 inhabitants, mostly in urban areas (Bunge 1983: 311). However, the Burma Broadcasting Service operated nine short-wave transmitters, broadcasting 111 hours a week in Burmese and English and 23 hours in minority languages. It has not been done but there is opportunity to utilize radio listening groups—a group of farmers, usually 10 to 20, organized by an extension worker. This group would meet to listen to a radio farm forum broadcast, discuss the content, and act upon the information received.

An adequate number of mass media materials provides a strong support base for extension field workers and increases the likelihood that field workers will have information to transmit to farmers. Lack of such materials or programs deprives extension field workers of needed educational tools and farmers of opportunities to learn about new technology. In general, the Burmese extension system was very weak in mass media activities.

**Time Allocation to Educational Duties.** An extension system cannot be effective if extension workers spend more of their time on non-educational duties than on educational activities. In Burma, divisional/state managers and township managers spend much of their time on administrative and financial duties. Most township managers were also very busy with non-educational activities such as distribution of seeds, fertilizers and pesticides. Monthly reports on
all expenditures and incomes from sales of agricultural inputs was a main task of township extension managers. Village managers were also responsible for timely distribution of agricultural inputs, collecting data, and collecting money from farmers for credit sales or repayment of agricultural loans. These non-educational duties decrease the amount of time each extension worker had available to spend on farmer education. According to the Agriculture Corporation, the average amount of time spent by an extension field officer on non-educational activities was 25 percent, but in the researcher's experience, this estimate was probably too low.

Technology Utilization Barriers. Technology utilization by farmers was associated with pricing and marketing policy, availability and use of agricultural credit, and access to physical inputs. In some countries the policy environment may act as a strong disincentive to increased agricultural performance.

Farmers will follow the technical advice of extension workers if they have price incentives, even though they may have concerns about technical aspects of production, such as which variety to plant or how much fertilizer to apply. In Burma, the government sets the price of agricultural commodities. Farmers sell their agricultural products according to a quota system to the government or cooperative agencies at a fixed price that was lower than that of the free (black) market. Farmers must meet compulsory delivery quotas of agricultural products,
especially paddy, at government fixed prices. After farmers have
delivered their quota of crops to government purchasers, any surplus
commodities could be sold on the black market. When the government
price of paddy to farmers was compared to world market price
(Table 19), the official price seems a poor incentive to produce more
paddy. The government price did not change for years. National price
policy can be a factor in the success of agricultural extension: if
price policy made higher production profitable for farmers, they would
be more likely to seek and heed the advice of extension agents.

Table 19

Export and Government Price of Paddy in Burma:
Kyats/46 lb. basket

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>(Domestic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>23.5</td>
<td>17.0</td>
<td>16.1</td>
<td>16.6</td>
<td>12.3</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Source: USAID (1988)

In Burma, most small farmers could not pay for agricultural
inputs. To meet the expenses of cultivating seasonal crops and high
yield crops, agricultural loans for 29 crops were disbursed to farmers
by Agricultural Banks. To cover the increase in the cost of
cultivation, agricultural loans for high yielding paddy varieties
under a special extension program were increased from 70 kyats per
acre to 140 kyats per acre after 1981 (Burma 1988). Farmers must re-pay loans after selling their crops. So far, no assessment or evaluation has been made to determine whether farmers used agricultural credits for agricultural purposes. However, agricultural credits by the government do encourage farmers to grow planned crops.

Another indicator associated with technology utilization was availability of physical inputs. In Burma, fertilizer demand had risen with the country's changing pattern of agriculture since 1976. Import and distribution of chemical fertilizers were undertaken by the Agriculture Corporation. Shortages of foreign exchange have meant that the Agriculture Corporation could not meet the fertilizer needs of farmers. Consequently, farmers could not always follow recommendations on fertilizer usage from extension workers. Table 20 shows fertilizer requirements and availability in Burma. Fertilizer shortages were one of the major constraints on increased crop production and greater technology utilization.

Table 20

<table>
<thead>
<tr>
<th>Year</th>
<th>Requirement</th>
<th>Supply</th>
<th>Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982-83</td>
<td>626</td>
<td>395</td>
<td>(-) 231</td>
</tr>
<tr>
<td>1983-84</td>
<td>665</td>
<td>451</td>
<td>(-) 214</td>
</tr>
<tr>
<td>1984-85</td>
<td>708</td>
<td>459</td>
<td>(-) 249</td>
</tr>
<tr>
<td>1985-86</td>
<td>747</td>
<td>484</td>
<td>(-) 263</td>
</tr>
</tbody>
</table>

One long-term indicator of technology utilization was agricultural production. Efficient growth in agriculture can be achieved by improving its technology and expanding its resources. These resources include labor and other human capital, physical capital and natural resources. Physical resource constraints may not be major impediments to large increases in agricultural production if technology was used effectively (Stevens and Jabara 1988). Much of the growth in agriculture in the United States and Japan, for instance, resulted from advanced technology.

Burmese agriculture made little progress for years because of inadequate utilization of both biological and mechanical technology, although there was much unused potentially arable land in the country. Burmese agriculture was very labor-intensive, and still lags well behind its potential in terms of yield. In Japan, the land area was very limited compared to Burma, but the yield per unit area of important crops was much higher. Tables 21 and 22 show agricultural land areas and yields of paddy, corn and wheat in Burma and Japan.

Table 21
Agricultural Land in Burma and Japan (Unit = 1000 ha)

<table>
<thead>
<tr>
<th>Country</th>
<th>Agricultural Land</th>
<th>% of Total Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burma</td>
<td>9985</td>
<td>10067</td>
</tr>
<tr>
<td>Japan</td>
<td>5088</td>
<td>4758</td>
</tr>
</tbody>
</table>

Table 22

Yield of Important Crops in Burma and Japan
Unit = kg/ha

<table>
<thead>
<tr>
<th>Country</th>
<th>1976</th>
<th>1986</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>paddy</td>
<td>corn</td>
</tr>
<tr>
<td>Burma</td>
<td>1897</td>
<td>797</td>
</tr>
<tr>
<td>Japan</td>
<td>5501</td>
<td>2619</td>
</tr>
</tbody>
</table>


Proportions of farmland to total land area were similar but the area of agricultural land in Burma had been increasing while that of Japan was decreasing. Meanwhile crop yields in Japan were higher than those in Burma, and still increasing.

**Monitoring and Evaluation.** Monitoring and evaluation were essential if program planners and administrators were to know the worth of any activity or program. It was very important in extension services to measure success, progress, or failure in meeting objectives. Evaluation was valuable to both administrators and extension workers because it puts them in a better position to decide what had been accomplished and what was needed in the future.

The Burmese extension system has not yet established a systematic procedure of monitoring and evaluation. Only when teams from donor agencies such as USAID, World Bank or UNDP come to Burma to evaluate...
the agricultural projects financed by their agency do officials from the Agriculture Corporation participate in evaluation activities.

Summary of Major Strengths and Weaknesses

Most extension systems in less developed countries do not have adequate linkages between research and extension functions either internally or externally, but the link between research and extension in Burma was relatively well established. There was direct contact between research staff and extension workers because two research divisions and the extension division were sub-units within a single department, the Agriculture Corporation. This link was one of the major strengths of the Burmese extension system, although the link did not extend to the agricultural education units in the colleges of agriculture or Institute of Agriculture in the Ministry of Education.

In terms of number of front-line extension workers, the Burmese extension system has a relatively larger number of village managers in position to contact farmers than do some other less developed countries. The ratio of extension agent to farmers was slightly better than the 1:800 ratio recommended by Benor et al. (1984).

The extension system in Burma only provides farmers with recommendations about production technology. The main concern was crop production, and it did not deal with other program areas as do extension services in the U.S. and some other countries.
Weaknesses and Limitations

The strategies for operation of the Burmese extension system were not well defined. They were not sufficiently specific as to subject-matter areas, clientele to be reached, and type of changes desired.

The importance of extension's role has still not been clearly perceived by policy makers in Burma. This was partly because the technological role of extension had been combined with non-educational duties and mainly because no workable organizational structure has emerged. The Burmese extension system has a highly centralized hierarchical structure. Because of this organizational structure, township managers have the least financial and administrative power although they could be key persons in an effective extension service. They need prior approval from higher authorities in respect to financial, administrative and agricultural activities.

Extension workers in Burma were generally more interested in their superiors' opinions of their worth than they were in farmers' opinions of their usefulness. In Burma, most extension workers were afraid of losing their jobs or especially of missing a promotion; it would be difficult for them to continue supporting their families if they lost their job because there were no job opportunities except in government agencies.

Because of political and organizational structures, there were too many political influences on extension activities in Burma. Extension
workers in Burma were controlled and supported by the central
government and they suffer from conflicting agendas between local
authorities and their superior officers at township or
divisional/state levels.

Because there was no relationship between extension and the
agricultural colleges or the Institute of Agriculture, there was no
coordination and cooperation among them — resulting in lack of
resource personnel and technical support for the extension service
from teaching institutions. Although there were two research
divisions allied with extension in the Agriculture Corporation, the
extension and research divisions or even the two research divisions do
not cooperate as closely as desirable. Most research and extension
personnel were reluctant to contact international agricultural
research institutions because of some political/organizational
restrictions; thus Burmese extension had a very weak linkage with the
international centers. In addition, the Burmese extension system did
not have a well-developed feedback mechanism to inform researchers
about farmers' problems and conditions.

Although the government allocated more public investment to the
agricultural sector since 1976, the extension system still receives
inadequate funds. Neither the extension nor research divisions obtain
any financial support from other sources, such as private chemical
firms; no private sector has existed in Burma since 1962. The central
government was the only funding agency for both agricultural extension and research.

Burma appeared to have inadequate resource persons for both extension and research. In general, the emphasis on manpower development had been very weak. A proper human resource development program has not been established. In the Burmese extension, less than one percent of total extension workers were subject matter specialists. Furthermore, there was no proper extension personnel management system in Burma. Lack of proper supervision and evaluation was a weakness of any extension system.

In addition, village managers—the first line extension agents—are not adequately trained. Their educational level was low and they were younger than their target farm family decision-makers. Consequently, they did not have much impact on rural small farmers.

The lack of subject matter specialists in Burmese extension system at all levels, including the national level, hindered access to research information. This was a great limitation to effective extension work in Burma. Burma's commitment to education in agriculture was not satisfactory in respect to the number of rural farm families or peasants. There was only the Institute of Agriculture at the university level and two junior colleges throughout the country. The curriculum and faculty at the Institute of Agriculture have been largely isolated from the mainstream of research and new technologies in sustainable agriculture throughout the
remainder of the developing world. The Burmese agricultural university (Institute of Agriculture) did not have a Department of Agricultural Education. The graduates of this institute often must learn their educational techniques by trial and error in the field. Consequently, the quality of graduates fluctuated. There was a lack of emphasis on practical training, and little coordination or cooperation with the nearby Agricultural Research Institute.

Program development procedures were lacking. There was no particular format for the developing agricultural extension programs in Burma. Programs (agricultural plans) were mandated from the top down without farmer involvement, needs assessment, or situational analyses. This one-way flow without peasant participation in the educational process, without feedback from peasants to research workers, greatly impeded the effectiveness of both extension and research. Traditionally, the emphasis in extension programs in Burma had been on techniques of agricultural production, but these programs do not necessarily meet the interests and problems of peasants. The Agriculture Corporation did not have a systematic procedure or method for monitoring and evaluating agricultural plans.

As far as technology dissemination was concerned, mass media exposure was very low among peasants in Burma. The Burmese extension system has a very limited capacity to produce or use mass media outputs and teaching materials. Extension personnel lacked adequate training in extension methods and communication skills because there
was no course work on these areas, even at the university level. They also lacked essential teaching and communication equipment and were not adequately provided with teaching aids such as technical publications by agricultural research workers.

Another of the weaknesses of the Burmese extension system was that extension workers spend much of their time on the distribution of agricultural inputs rather than educational activities. The procurement and distribution division of the Agriculture Corporation handled physical distribution of imported and locally produced fertilizers. Fertilizers were then sold to farmers at sales depots in townships by village-tract or village managers (extension personnel). Apart from fertilizers, the Agriculture Corporation also handled procurement and distribution of seed, agropesticides, and sprayers, so most village managers and township managers must spend much of their time on non-educational activities.

Burma was also very weak in the area of technology development. Although there were two research divisions under the Agriculture Corporation, the capacity to produce new technology was not at a satisfactory stage. Joint on-farm demonstrations by research and extension were very few, and no technical publications such as research journals, crop production handbooks, extension bulletins for a specific crop, etc., have been produced by these two research organizations in recent years. Thus, most research findings could not be made readily available to peasants. Agricultural research services
have had a limited impact in Burma because most research farms lack adequately trained personnel and work mostly on seed multiplication programs.

Utilization of non-traditional technology by Burmese small farmers was very limited because of such factors as pricing policy and chronic shortages of agricultural inputs, particularly chemical fertilizers. Official government prices were not an attractive incentive for peasants to increase crop production. Although fertilizer demand has increased since high-yielding paddy varieties were introduced in 1976, the supply of fertilizer has not improved correspondingly. These factors limit the use of technology, the level of production of crops, and the effectiveness and efficiency of the extension system.

Description and Analysis of the Cooperative Extension Service:
The United States Land-Grant Model

Historically, the U.S. has fostered agricultural development. Historical records showed that George Washington experimented with different crops and farming methods at his estate in Mount Vernon, Virginia. Thomas Jefferson was the foremost agriculturalist of his day. Daniel Webster designed and built a new plow to use on his farm. In 1743, Benjamin Franklin performed his own experiments and disseminated the latest information available in the field of "scientific" agriculture. The year 1862 was very important year for federal legislation related to agriculture. The "Organic Act" was
signed by President Abraham Lincoln on May 15, 1862 to establish the United States Department of Agriculture (USDA). In the same year, the United States Congress mandated the Morrill Land-Grant Act or sometimes it was referred as Land-Grant College Act. This bill was proposed by Senator Justin Morrill and signed by the President Lincoln on July 2, 1862. This act provided grants of public land on the basis of 30,000 acres to states for the establishment and maintenance of at least one college in a state where the main objective was to provide higher education opportunities for the study of agricultural and mechanical arts. By 1870, 36 such colleges were established and the number grew to 69 by 1962 (Fay, 1962). Through the Morrill Act, the federal government was endowing state educational institutions with no federal supervision of methods of instruction and with little limitation on what or who was to be taught. Management and administration of the Land-Grant colleges were carried out by their respective states.

A few years later, it became evident that these colleges had too little to teach that would help young people solve practical problems of running a farm. They studied courses in mathematics and basic sciences; however, little at the colleges was taught in the area of direct practical methods that would make farming more productive. Therefore, in 1870, Congress, recognizing this difference and the importance of research passed a new law called the Hatch Act. William Henry Hatch of Missouri, Chairman of the House Committee on
Agriculture, introduced a bill to institute an agricultural experiment station in each of the colleges formed under the Morrill Land-Grant Act of 1862. The text of the bill was:

"In order to aid in acquiring and diffusing among the people of the U.S. useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

A provision of the Hatch Act required research results to be disseminated in the form of periodic and annual reports and occasional bulletins to each newspaper in the state and to farmers who might request them. These experiment station results and publications were used by agricultural college professors in their classes as well as during the farmers' institutes. In this way, colleges of agriculture had a growing reserve of materials to teach that were directly applicable to farming. The control and administration of the experiment station in each state was given to the state colleges of agriculture. The federal government gave each state financial aid to carry on the work of the experiment stations, but the control and direction of the work was left to the colleges of agriculture. The Federal government only asked the state to draw up plans in advance for information about what kinds of experiments or research would be carried out.

Experiment stations were continuously developing practical methods for meeting all types of farm problems. The colleges were teaching
the new discoveries to the farm young people who enrolled. However, it was not possible to teach these new and superior production methods to thousands of farmers in every state. There was no direct line of communication to efficiently and effectively carry new and improved methods to individual farmers in every part of the state. Colleges of agriculture and progressive farmers were aware of this problem. In some states an improved tested method was carefully described in a bulletin which would be sent free to any farmer on request. Some colleges directed certain professors to go into the state to conduct one to three day Farmers' Institute where farmers could discuss their problems and be given help in their solution. Various agricultural societies invited speakers from Agricultural colleges to give lecture at their meetings on improved methods of farming. In 1902, Seaman A. Knapp was appointed by the USDA as a special extension agent; he developed the farm demonstration approach to show improved agricultural practices. His belief was that most farmers were not convinced of the value of a new method by merely reading bulletins or hearing about it in a lecture. Farmers were willing to employ a new idea in farming only after they had actually seen it carried out in a demonstration. Demonstrations related to cotton boll weevil conducted by Dr. Knapp were very successful. There was an insistent demand for a service that could keep all farmers in constant touch with the new discoveries of the experiment stations. National recognition of the need for a countrywide extension service resulted in the passage of
the Smith-Lever Act on May 8, 1914, by Congress. This law provided funds to all states for the establishment of an extension service. The Smith-Lever act was the foundation upon which the whole Cooperative Extension Service work was built. The text of the bill is:

"The work shall consists of giving instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on agricultural and home economics through field demonstrations, publications, and otherwise."

The essence of the Smith-Lever act was:

1. The Land Grant College of Agriculture in each state would be responsible for the organization and administration of the program.

2. Plans for the extension education programs should be mutually agreed upon by the Land-Grant college and the USDA.

3. All teaching by extension agents should be designed for persons not attending college, with no limitation as to age, sex, or race and should be "the giving of instruction ... in agriculture, home economics and subjects related thereto."

Objectives of Cooperative Extension Service

The basic mission of the Cooperative Extension Service was to disseminate and encourage the application of research-generated knowledge and leadership techniques to individuals, families and communities (USDA and NASULGC Report, 1983).
Some Principles of Cooperative Extension Service

Several lists of principles of extension service have been developed over the years. Many extension service principles were embodied in the "Extension Workers Creed" that was developed in 1960 by Epsilon Sigma Phi, the professional honorary society for extension workers. This creed described as follows:

I BELIEVE in people and their hopes, their aspirations and their faith; in their right to make their own plans and arrive at their own decisions; in their ability and power to enlarge their lives and plan for the happiness of those they love.

I BELIEVE that education, of which extension work was an essential part, was basic in stimulating individual initiative, self-determination, and leadership, that these were the keys to democracy and that people, when given facts they understand, will act not only in their self-interest but also in the interest of society.

I BELIEVE that education was a lifelong process and the greatest university was the home; that my success as a teacher was proportional to those qualities of mind and spirit that give me welcome entrance to the homes of the families I serve.

I BELIEVE in intellectual freedom to search for the present, the truth without bias and with courteous tolerance toward the views of others.

I BELIEVE that the Extension Service was a link between the people and the everchanging discoveries in the laboratories.

I BELIEVE in the public institutions of which I am a part.

I BELIEVE in my own work and in the opportunity I have to make my life useful to mankind.

Because I BELIEVE these things, I am an extension worker (Prawl et al., 1984, p. 30).
**Philosophy of Cooperative Extension Services**

The basic philosophy of extension education was to teach people "how" to think, not "what" to think. The theme of Cooperative Extension Service was to help people help themselves. The other important philosophy of Cooperative Extension Service was that it assumed that the aims and objectives were not to be fixed and unchangeable. The objectives must be modified on the basis of individual and social needs (Prawl et al. 1984:31)

**Organization**

The Extension Service in the U.S. was a cooperative arrangement between the Land-Grant university and the USDA. There was an Extension Service for each state. According to the law, each state extension service was a part of the Land-Grant institution for the state. There was a memorandum of understanding between Land-Grant institutions and the USDA. This memorandum of understanding had been the basis on which extension work of the Agriculture colleges and the USDA had been conducted since the passage of the Smith Lever Act.

On the basis of the memorandum of understanding, the State cooperating institution organized and maintained a definite and distinct administrative division for the management and conduct of extension work in agriculture and home economics. The memorandum of
understanding had been used as a basis for procedures. The agreement had three principal parts as follows:

1. The State College agreed:
   a. To organize and maintain a definite administrative division for the management and conduct of the work.
   b. To administer all funds through such division.
   c. To cooperate with the USDA in all extension work which the Department was authorized to conduct in the State.

2. The USDA agreed:
   a. To establish and maintain a central office for the general supervision of all extension work.
   b. To conduct all its extension work in the state in cooperation with the college.

3. It was mutually agreed:
   a. That the work should be planned under the joint supervision of the state director and the responsible officer for the USDA.
   b. That all appointees should be joint representatives.
   c. That plans should be made and executed by the states subject to the approval of the Secretary of Agriculture.

Subsequent legislation put emphasis on work with boys and girls, out-of-school youths, and women, and on standard of living, better marketing and distribution, farm and home buildings, farm and home
planning and nutrition. However, program procedures and administration varied from one state to another (Kelsey & Hearne, 1963, p.33).

Actually, the cooperative extension service was a branch of the Land-Grant institution. The cooperative extension work comprised three main categories of participants, the county services, the Land-Grant colleges and the Federal Extension Service of the USDA. In other words, the cooperative extension service in the U.S. has three major units: the national level, state level and county level. Each has an organizational pattern accepted and adapted to the work of the unit.

**National Extension Service of the USDA**

The USDA existed to do things which the State Extension service could not do easily or readily. The USDA kept the national network of cooperative extension service alive and functioning. As a nationwide educational network in the national interest, the cooperative extension system included professional staff in nearly all of the nation's 3150 counties and in each of the 1862 Land-Grant universities (in the 50 states, Puerto Rico, the Virgin Islands, Guam, American Samoa, Micronesia and the District of Columbia), in the Tuskegee Institute and in the sixteen 1890 Land-Grant universities in 16 states (USDA February 1986). In addition to professional staff, thousands of paraprofessional staff have served in many counties and nearly three
millions of volunteer leaders assist in extending programs under training and direction from cooperative extension staff. In 1982 at the national level, there were only 116 professionals within the USDA; these people direct federal fund allocation, coordinate national initiatives, provide program leadership and facilitate linkages to the USDA and Congress.

Except for the 116 professional staff at the federal level, extension staff were employees of the Land-Grant institutions and were not direct line employees of any of the three levels of government. In 1982, the total number of staff for different positions of the cooperative extension service throughout the whole country was 16,849 (Warner & Christenson, 1984:11).

The USDA has a staff, line officers and auxiliary offices. There were administrative and supervising jobs to do. The Administrator of the Extension Service at the USDA was responsible to the Secretary of Agriculture. The administrator has persons under his/her direction to help him/her carry out the functions of the cooperative extension service. These administrative, supervisory, and specialized personnel assist the state extension services in those fields that relate to the work of the national extension service. In general, the federal extension service of the USDA was responsible for the administration of the Smith-Lever Act and for other laws and regulations involving cooperative extension work, for approving state cooperative extension service work plans and for determining that federal funds were used
properly to meet congressional intent and USDA requirements, for providing administrative and technical program assistance to the States and for serving as a link among the states, other USDA agencies, and other parts of the Federal government. The USDA also approved the appointment of each state director of extension and informed the public about state extension programs and the progress made.

In 1982, John Block, the Secretary of Agriculture, and Robert Clodius, President of the National Association of State Universities and Land-Grant colleges, appointed a blue ribbon committee — extension in the 80's — to examine the Cooperative Extension system. The committee addressed the mission, scope, priorities and policies for the future of the system including the federal partner. This committee identified five major functions for Extension Service, USDA. These functions included:

* National Program Leadership and Management
* National Policy Formulation and Implementation
* Organization, Coordination and Representation
* National Accountability and Evaluation
* Administration and Administrative Management

(USDA 1983, Challenge and Change ... p. 3)

The USDA comprised seven different divisions with an assistant secretary and six divisions directly under the secretary (Figure 2). These seven divisions were: 1) Administration; 2) Food and Consumer
Services; 3) Economics; 4) Governmental and Public Affairs; 5) Science and education; 6) Natural Resources and Environment; and 7) Marketing and Inspection Services. The Federal cooperative extension service was one of the four areas under the Science and Education division. Again, the Federal Extension Service of the USDA comprised six areas (Figure 3). These areas were: 1) Agriculture; 2) Home Economics and Human Nutrition; 3) 4H and youth development; 4) Natural Resources and Rural Development; 5) Program Development, Evaluation and Management systems; and 6) the area for Information and Communication and Equal opportunity (USDA 1983).
Figure 2 - USDA Organizational Chart - Source: USDA (1988)
MISSION: The mission of the Extension Service, USDA, is to provide national leadership and represent the U.S. Department of Agriculture within the Cooperative Extension system. The mission of the Cooperative Extension system is to improve American agriculture and strengthen American families and communities through informal, research-based education.

FIGURE 3. Extension Service Organization Chart
Extension Committee on Organization and Policy

In the U.S. Land-Grant Extension model, there was a committee established to serve as a kind of "board of directors" such as found in other organizations. This committee was known as the Extension Committee on Organization and Policy (ECOP). ECOP was a national level standing committee of the National Association of State universities and Land-Grant Colleges acting as a kind of "board of directors' for the extension service. ECOP has 24 voting members — three state directors from each of four Extension Service regions, one from the 1890 colleges, and the federal administrator of extension. ECOP, which meets three times a year, serves as a planning and policy development arm of the Extension Service.

The State Extension Service

The State Director of Extension was the head of the State Extension Service. The State Director of Extension was selected by the governing body of the state institution. The selection must be approved by the USDA. In some states, the cooperating Land-Grant institution was the state university like The Ohio State University; in others it was a state college.

Generally, the organization of the State Extension service has two types with some variations in different states. One type was that the Dean of the College of Agriculture was also the director of the cooperative extension service in some states. A variation of this was
where the dean was also director with an assistant, associate or deputy director in operational charge of extension work. In others, there was a director of extension responsible to the dean of the College of Agriculture. Another type was the university with a state college of agriculture and home economics. The Director of extension was responsible jointly to the dean of both of these colleges for their cooperative extension work. The State colleges, with a director of extension, was responsible to the president of the institution. The director of extension was also responsible for all extension done by the institution. Regardless of the type of state organization, the basic unit was the County Extension Service. The Organization of the State Extension Service was arranged to do those things which the County Extension Service could not do easily or readily. The State Extension Services were organized to help the County Extension Service perform their functions. There was a line organization composed of directors, supervisors, county extension agents (unit chairs) and county faculty. Through this line organization pass the administrative and supervisory responsibilities of the service. Some of these included: organizing the service for most efficient work; personnel selection; training and management; determining and carrying out policies; developing programs and making plans to carry out the purposes and objectives of the programs; evaluating the effectiveness of the organization and of the work to the public; arranging for funds to finance the work; establishing and maintaining satisfactory
relationships between the college and the county cooperating groups and reporting to officials and to the public. Authority flows through the line of organization. An example of the State of Ohio cooperative extension service organization was shown in Figure 4 of the Ohio State. In the State of Ohio there were five districts and 88 counties (See Figure 5). District specialists (subject matter specialists) were working with district directors in cooperation with county agents.

**OHIO COOPERATIVE EXTENSION SERVICE**

**ORGANIZATION CHART**

---

**Fig 4.** Ohio Cooperative Extension Service, organization chart.
Figure 5. Extension Districts and Counties of the Ohio Cooperative Extension Service. The Ohio State University.
(Source: OCES, 1985)

*District Extension offices, located on this map, are staffed by faculty who provide technical backup help to county agents as well as program coordination and assistance in program planning.
County Extension Service

A county was an administrative subdivision of a state. In addition to the memorandum of agreement between the Land-Grant colleges and the USDA, there was also an understanding between the state and counties for the conduct of extension work in each county. The county extension office was the unit by which the objectives of the cooperative extension services were attained as it worked with rural people. The members of the county staff were key persons in the extension organization. County Extension agents were assigned with at least one in a county. The number of county extension agents to be assigned in a county depended on criteria such as total households, rural population, number of farms, program areas and county financial support etc. County Extension agents were generally assigned for agriculture, 4H youth programs and home economics in a county depending on the nature of the county. Among the county agents in a county, one agent was assigned as chairperson or head of the county extension service. In general, the county extension agents for agriculture was also in charge of community and natural resources development program in the county. County extension agents may have single or multi-county assignments. Both single and multi-county extension agents were responsible for the total program in their area of responsibility. County extension agents usually work with different extension advisory committees formed in each county.
Extension Committees

At the State and County level, there were advisory committees established to assist cooperative extension service. The number and kinds of extension advisory committees varied somewhat among the different counties and sections of the state depending on local conditions, diversity of the agricultural industry, community issues, family living approaches, youth development concerns, and needs and interests of the people in the county, etc. The following Advisory and Support committees were examples of The Ohio State (The Ohio cooperative extension service, 1983). The Executive Committee approved the following general guidelines for The Ohio State Extension Committees.

GUIDELINES FOR STATE EXTENSION ADVISORY COMMITTEE

Functions
1. To assist the Extension staff of The Ohio State University to evaluate the needs, wants, and desires of people.
2. To counsel and advise with the State Extension Service in the development of Extension programs, policies, and request budgets.
3. To encourage and support strong Extension advisory committees in each county.
4. To provide effective communication between county advisory groups and other allied interests and the State Extension Advisory Committee.
5. To assist the Extension Service in working out relationships with other groups carrying on educational programs in related fields.

6. To keep the public informed of the nature, functions, and policies of the State Extension Service.

7. To assist in evaluation the work of the Extension Service.

Membership

The State Extension Advisory Committee consisted of the chairperson, vice-chairperson, and secretary of the County Extension advisory committee from each county, chairperson of the county support committee from each county, and the Executive Committee of the State Extension Advisory Committee. Members served until their successors have been chosen. At the annual meeting, each county had one vote.

Meetings

An annual meeting was held at such time and place as designated by the chairperson of the State Extension Advisory Committee in conference with the Director of OCES. Special meetings were requested by the Director of OCES when counsel and advice was needed before the date of the next annual meeting.

Executive Committee

The Executive Committee consisted of the following: 15 members (three from each of the five extension districts).
Ten members selected as follows:

4 - Agricultural program area

2 - 4H program area

2 - Home Economics program area

2 - Community and Natural Resource development program area

These members were to be recommended by Assistant Director to the Director in consultation with departments and appropriate statewide organization. The Director will make final appointments.

The following members will be appointed by the Director in consultation with officers of the committee and other appropriate groups:

3 - members at large

3 - members from funding agencies (County, state, and Federal)

1 - Ohio Cooperative extension Agents Association

1 - Ohio Extension Professors Association

2 - Media Representatives

2 - Chairperson and Vice-Chairperson of State Support Committee

Ex-officio members were as follows:

2 - Department Chairperson, appointed by Director (not more than one from a program area)

2 - North Central Regional Advisory Committee Representatives

1 - National Extension Advisory Committee Representative

1 - CARET representative (Council for Agricultural Research, Extension and Teaching)
5 - District Directors
6 - Assistant Directors and Director
1 - Vice President for Agricultural Administration

Members of the Executive Committee serve for three year terms or until their successors were elected, with one-third of the membership having opportunity to change each year. Appointment to the Executive Committee was effective on January 1.

Officers

Officers of the Executive Committee consisted of a chairperson, a vice-chairperson, and a secretary. The officers were elected at the fall meeting by the Executive Committee members and serve for two year terms. These officers serve both the Ohio cooperative extension service Advisory committee and the Executive Committee of that group, and serve as members of the State Support Committee.

State Extension Support Committee

The State Extension Support Committee functions as a subcommittee of the Executive Committee, state Extension Advisory Committee. The following were the purposes of the Committee (Ohio cooperative extension service, The Ohio State University, 1983).

Purposes

1. To encourage and assist county extension support committee in their efforts to strengthen the county extension programs.
2. To coordinate activities of county extension support committees relative to state and national issues and concerns.

3. To assist Extension administration in support of the budget request through The Ohio State University, the Ohio Board of Regents, and the executive and legislative branches of county, state and federal government.

4. To assist Extension Committee on Organization and Policy (ECOP) with the development and support of federal budgets by representation on regional and national committees.

5. To develop strategy for consideration and action on state and federal legislation of importance to cooperative extension.

Membership

Support committee members were selected as follows:

5 - One lay leader from each of the extension districts from the Executive committee

5 - One at-large leaders selected from each Extension district, appointed by the Director. These selected individuals were to be key leaders in the county, area, or state. They should be high level business executives or private citizens who were influential in their communities, in groups served by Extension, in political parties, and who were supporters of extension.

5 - Statewide business representatives
2 - Chairperson and Vice-chairperson of Executive Committee, State Extension Advisory Committee

3 - Ex officio members - Vice President for Agricultural Administration, Director and Assistant Director, Administration.

Terms were on a calendar year basis. Members will serve a two year term and may be reappointed for one additional two year term.

The County Extension Committees

The main committee at the county level was the County Extension Advisory Committee. The number of committee members of the advisory committee and the number of other committees established in a county varies from one county to another and from state to state. The County Extension Advisory Committee was elected carefully and properly so that it represents adequately the interests of the people. The committee members were usually elected by the local residents (clientele) at an annual meeting. The primary purpose of the County Extension Advisory Committee was to assist county extension agents and extension administration in planning, conducting, evaluating educational programs and in publicizing their effectiveness. These deal with the improvement of all four program areas of agriculture, home economics, community and natural resources development and 4-H youth development. The Extension Advisory Committee serves in an
advisory capacity to the extension faculty. The committee has not legal powers to put recommendations into action.

There were other subcommittees such as County Extension Support committee and program committees. The purposes, functions, and procedures of the County Extension Advisory Committee and support committees were very similar to those at the state level. Program committees were established in a particular county depending on the program areas to be delivered. Such program committees as Agronomy committee, sheep and lamb improvement committee, 4-H committee, conservation tillage committee, swine committee etc., were established as required. All committee members were elected by the residents. They were not paid for their services. They were volunteer extension workers and very willing to serve for their community development. The volunteers can offer their knowledge, skills and expertise free of charge. The volunteer services was the lifeblood of the cooperative extension service in the U.S.

**Duties and Qualifications of Extension Workers**

Kelsey and Hearne (1963) described the essential qualities of extension workers. These were the ability to plan, initiative, resourcefulness, integrity, faith, courage, judgment, perserverance, tact and power of expression. In addition, technical ability was one of the most important requirements for all cooperative extension workers. Specific qualifications were required for each position to
work for cooperative extension service in the U.S. For example, the followings were some of the qualifications required for each job in extension.

Qualifications of Directors and Supervisors

The Extension Director, Assistant Directors and District Supervisors were generally administrators. Kelsey and Hearne (1963) presented the following qualifications required for an extension administrator:

1. Successful experience in one or more, preferably several, of the fields of work which he/she was to administer.
2. Established position of leadership and confidence among those with whom he/she was to work.
3. Farm, or at least agricultural background
4. Education of college grade.
5. High personal qualifications as follows:
   a. Integrity
   b. Fairness and sound judgement
   c. Health (personal appearance must be considered along with health)
   d. Sense of purpose or direction
   e. Technical mastery
   f. Decisiveness
   g. Faith
h. Courage  
i. Initiative  
j. Perserverance  
k. Versatility  
l. Power of expression (in the written and the spoken word)  
m. Sense of humor  
n. Organization sensitivity

Kelsey and Hearne (1963) also suggested the required qualifications for a specialist and extension county agent as follows:

Qualifications of a Specialist

A. Background  
1. It was preferrable that each individual have a rural background, with some farm or homemaking experience.

B. Training  
1. Minimum requirement of Bachelor's degree from an institution of recognized standing  
2. Broad basic scientific training  
3. Major emphasis in field of specialty  
4. Graduate study usually helpful

C. Experience  
1. Farm or homemaking experience desirable.  
2. County extension experience desirable but not practical for some types of specialists.
3. Experience in working with the public in a related field may substitute for previous extension experience.

D. Characteristics
1. Effective teaching ability
   a. Able to assist agents in organizing and developing programs
   b. Able to use effectively applicable teaching techniques
   c. Able to evaluate his/her own and agents' programs
2. Ability to plan and cooperate with others
3. Vision and leadership
4. Sympathetic attitude toward associates
5. Clear and systematic thinking
6. Effective speaking and writing
7. Tact
8. Enthusiasm

E. Philosophy
1. His/her work was a contribution to a general plan for the betterment of rural life and living. Community welfare should be his/her goal not the promotion of his/her own work.

Qualifications of County Extension Agent

A. Background and Experience
1. It was desirable that the individual have a rural background.
2. Experience as a farm operator, homemaker, or a 4-H member was desirable.
3. Teaching experience was often helpful.
4. Experience was working with the public in a related field was helpful.

B. Training
1. Minimum requirement should be a Bachelor's degree from an institution of recognized standing (County Extension agents in the state of Ohio must have a minimum of a Masters degree in the appropriate subject matter – OCES, 1987)
2. Special courses in extension work and related subjects were highly desirable.
3. High technical ability in a broad field.

C. Characteristics
1. Teaching ability
2. Ability to plan and cooperate with others.
3. Vision and leadership
4. Sympathetic attitude towards associates
5. Clear and systematic thinking
6. Effective speaking and writing
7. Tact and interest in people
8. Enthusiasm with reliability
9. Faith and courage
10. Integrity and dependability
Duties of the State Extension Directors

The Extension Director was the administrator of the Extension Service in his/her state. Therefore, there were a large number of duties to be carried out by the Extension Director. The director usually delegated some of those duties -- although he/she could not avoid the final responsibility for them. The principal duties of an extension director were organization, personnel selection and management, policy determination, program determination, supervision, financial matters, relationships with the public and with other governmental and educational agencies, evaluation and reporting to officials and the public. Job descriptions of the Ohio Cooperative Extension Director were attached in Appendix B as an example.

The primary duties of a District Supervisor were:

1. Administrative matters to assist State Extension Directors
2. Keeping the extension organization functioning smoothly in his/her territory and
3. Serving as a director of field operations, as a planner, as a teacher, and as an appraiser.
4. The District Supervisor acts as a link in communication between county staff, state specialists and the Director's office.
5. The District Director was responsible to the Director's office for a unified integrated extension program in keeping with the needs and interests of the people in the district and the overall policies as determined on a state level.
Appendix B describes the detailed functions of a District Supervisor in the State of Ohio.

In general, the duties of a subject matter specialist were:

1. Keeping state and county extension workers up to date with regard to the findings of science and their application to the solution of farm and home problems.

2. Serving as a bridge between subject matter research departments and field extension workers; interpreting the results of research in terms of desirable farm and home practices.

3. Assembling and analyzing facts, clarifying problems in the subject matter field, studying the status of his/her enterprise throughout the state and the nation.

4. Helping county agents to develop sound county and community programs in which subject matter was correlated to best serve the interests of the farm and home as a family unit.

5. Assisting agents in the effective use of teaching methods.

6. Backing up the county programs with suitable statewide publicity, popular bulletins, form letters, motion pictures, film strips, slides, exhibit materials, and other teaching aids.

7. Making studies to determine successful and unsuccessful methods of organizing and conducting extension teaching in the particular subject matter field.
8. Outlining measuring devices and procedures applicable to the subject matter problems begin attacked and assisting agents in their use.

9. Handling direct teaching of rural people within the county in such a manner as to strengthen the position of the county worker and enable him/her to better to meet subject-matter problems arising after the specialist's departure. (Kelsey and Hearne, 1963, p. 74)

Duties of the County Extension Agent

In the U.S., the various kinds of county extension workers perform similar functions. The following general statement of duties for all types of county agents were described by Kelsey and Hearne (1963).

1. Represents the state Land-Grant institution and the United States Department of Agriculture in the county in carrying on an educational program to improve rural life.

2. Studies the county, its people, and its agriculture and rural life to ascertain its problems and possibilities.

3. Develops or aids in maintaining the necessary organization of rural people to help determine and carry out the county extension program.

4. Develop with the people of the county a long time and current agricultural and rural life educational program based on the major problems and needs of individuals — adult and youth — and families.
5. Develop rural leadership

6. Assists local organizations with their educational programs when their objectives coincide with the objectives of the county extension program.

7. Promotes friendly relationships and the coordination of activities of all agricultural and county life groups within the county.

8. Maintains a public office where rural people and others may call, telephone, or write for information on all problems relating to agriculture and rural life.

9. Keeps informed regarding social and economic changes affecting the farms and homes of the county, and keeps up to date professionally through attendance at conferences, reading, participation in in-service training courses and otherwise.

10. Develops interest and cooperation of various organizations and individuals in the solution of farm, home, and community problems.

11. Assists local leaders by supplying supplementary material, visiting farms and homes, providing helpful literature.


13. Provides information to individuals and groups other than those regularly organized.
14. Helps evaluate work done by obtaining and analyzing records and preparing statistical and narrative reports for county, state and federal use.

15. Encourages the interest and cooperation of various organizations and rural people in the development of boys and girls through club work.

16. Assists people in the communities in the organization of local 4-H clubs, in the selection and training of local leaders and in the development of club programs.

Appendix B describes the detailed functions of a county extension agent in the State of Ohio (OCES, 1987).
Program Areas and Program Development

The fundamental purpose of the cooperative extension service was the development of an educational program as it was a system for informal education. According to Kelsey (1963) extension programs were a statement of situation, objectives, problems and solutions. Program development included the total of extension's responsibility, from the first step in planning to final evaluation of the changes in peoples' behavior. The program areas carried out by the cooperative extension service are: 1) agriculture; 2) home economics, 3) 4-H youth development; and 4) community and natural resources development.

According to the purposes specified in the original legislation, the cooperative extension service was to disseminate and encourage the application of useful and practical information relating to agriculture, home economics and related subjects among the people of the U.S. not enrolled in Land-Grant Colleges. Hence, extension administrators give more attention to program development. Extension workers in the U.S. were educators who were responsible for establishing the teaching techniques to be used beforehand in order to achieve the maximum success. Extension educators (county agents) knew the principles of teaching and learning. Educational programs were based on the needs and interests of the people. Need assessment and situational analysis were carried out before the program had been started. Need assessment and situational analysis were the most
important factors in identifying problems from the situation and consequently the objectives.
Objectives were always derived from the problems and problems from the needs of the people. Thus, the effectiveness of a program depends on local recognition of the need for it and people involved in the program development process. Generally, the program development carried out by the cooperative extension service had the following five elements.

(1) **Program Planning.** Extension program planning was a continuous process of making decisions about the important needs or problems in a country, setting goals or objectives and taking action to accomplish the goals. The identification of the needs or problems was to be achieved by local people, assisted by professional people including the extension staff.

(2) **The Planned Extension Program (written program statement).** The planned program was in written form. It describes the existing situation in the county as a whole or the various areas in the county. The written program statement included: (a) statements of current basic facts that reveal the situation for each major commodity, enterprise, or problem area in the country, (b) statements of significant needs, interests, or problems of the people, and (c) statements of immediate and long-time objectives for meeting the identified needs and problems through extension teaching.
(3) The Annual Plan of Work. The annual plan of work was a written procedure of detailed action to guide extension teaching in the different phases of the program. It was a blueprint for the agents to use for themselves and for others who function in teaching roles. A plan of work indicates the people to be taught, desired behavior changes, content or subject matter involved, what methods will be used, who will do the various jobs, when and where the job will be done, and evidence needed to evaluate results.

(4) Program Action (Implementation). Program action was the process of carrying through previously planned educational jobs and learning situations as set forth in the program of work.

(5) Evaluation of Accomplishments. Extension accomplishments were defined in terms of changes in people and the changes they make in their economic and social situations resulting from the program. Information which reveals the extent to which objectives were reached was needed to evaluate accomplishments. The concept of evaluation focused primarily on program effectiveness or how well the objectives were accomplished. Evaluation was not an end to programming but a transition to follow-up programming based on evaluation results.
Program Delivery Methods

Extension's basic unit was the county extension office which delivered programs. The variety of extension teaching methods used by county agents included farm and home visits, office calls, meetings, conferences, telephone calls, replying to mail requests, method and result demonstrations, tours and field days, printed matter, exhibits, tape recording, radio, television and other kinds including satellite programs. There was no discrimination by the cooperative extension service. Extension service makes its educational programs available to all segments of the public regardless of their geographical, occupational or socio-economic backgrounds.

Funding

All three levels of government shared in the financial support and program development but not necessarily in equal portions. Although there was considerable variation by county and state, about 38 percent of the extension budget comes from the federal level, 44 percent from states and 18 percent from local governments in yearly average (Warner and Christenson, 1984). This balance in funding support had been quite stable since about 1955. However, since 1975, the federal portion began to decline, while the states' portion had increased. The federal contribution was distributed to states in the form of formula and earmarked funds. Formula funds were not restricted for use in any specific program; but earmarked funds were
used to meet specific needs identified by the federal partner. Examples of such programs were the Expanded Food and Nutrition Education Program, Integrated Pest Management, the small farmer program, rural development, farm safety, and urban 4-H. The service of extension was provided to clientele without charge. However, in order to recover some cost of printing, the extension service in many states charges for some publications.

Analysis of the Cooperative Extension System. Using Specific Criteria

The cooperative extension service had a close linkage with research and educational institutions as well as with supply, marketing and governing services. The present success of agriculture in the U.S. reflects in effective cooperative relations between the Land-Grant Colleges and the U.S. Department of Agriculture. The U.S. Department of Agriculture, as a Federal agency and the Land-Grant Colleges, as state-administered institutions supported in part by Federal grants, have carried on many interdependent and cooperative programs since they were established. The U.S. agricultural extension system had sufficient research-generated knowledge to transfer effectively to farmers. In 1860, two years before the Organic Acts were passed, one farm worker supported only 4.53 persons. In 1890, three years after the Hatch Experiment Station Act became law, one farm worker supported 26 persons (USDA, 1962). In 1982, each farmer produced enough food to feed 78 persons (Prawl et al., 1984). Credit for this increase in productivity must go to technology improvement of
farmers by linkage between extension and research. The well organized agricultural research stations and closely related cooperative extension services extend new knowledge through informal educational programs from the scientific laboratory and experimental plots to the farmers.

To transfer technology effectively, an extension system must have continuing access to improved technology. The following information provides an overview of the degree of linkage between research and extension and to analyze if the cooperative extension service had ability to access to new technology from research.

Table 23

Frequency and Level of Contact between Extension and Research (1987-1988)

<table>
<thead>
<tr>
<th>Types of Contact</th>
<th>Approximate Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Research papers received by extension</td>
<td>25,000</td>
</tr>
<tr>
<td>-Technical reports received by extension</td>
<td>20,000</td>
</tr>
<tr>
<td>-Workshop/training sessions given by research to extension personnel on new technology</td>
<td>200</td>
</tr>
<tr>
<td>-Joint on-farm trials conducted by research and extension</td>
<td>30,000</td>
</tr>
<tr>
<td>-Joint demonstrations conducted by research and extension</td>
<td>45,000</td>
</tr>
<tr>
<td>-Joint research-extension field days conducted</td>
<td>4,000</td>
</tr>
<tr>
<td>-Joint planning/coordination meetings between research and extension to develop technical recommendations</td>
<td>100,000</td>
</tr>
</tbody>
</table>

In addition to these types of contacts between extension and research, numerous extension bulletins were prepared by different states depending on the local needs. For example, the number of extension bulletins produced by the Ohio Cooperative Extension Service (OCES) alone in 1988 was 1027 (OCES, 1989). Thus, it was obvious that the flow of technology to farmers was adequate and appropriate.

**Adequate Financial Resources**

In the U.S., the financial support to the cooperative extension service was given by the three levels of government. According to Warner and Christenson (1984), the federal portion had begun to decline while the states' portion had increased since 1975. However, there was consistent financial support to the cooperative extension service. According to F.A.O. Survey Report (1989), the Federal government had been increasing annual recurrent expenditures of extension, Table 27. According to Karr (1986), the Reagan administration originally planned to end federal extension service aid entirely in 1986 and finally proposed to reduce the federal contribution by 60 percent. If the federal government had a tendency to cut the budget in the future, extension programs will be limited. Therefore, the government's financial commitment to agricultural sector was very important for carrying out the extension programs.
Table 24

Annual Recurrent Expenditures of Extension alone and the whole USDA (U.S. Dollars in millions)

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Extension</th>
<th>U.S. Department of Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>64</td>
<td>5,683</td>
</tr>
<tr>
<td>1965</td>
<td>86</td>
<td>7,269</td>
</tr>
<tr>
<td>1970</td>
<td>132</td>
<td>9,513</td>
</tr>
<tr>
<td>1975</td>
<td>216</td>
<td>15,205</td>
</tr>
<tr>
<td>1980</td>
<td>274</td>
<td>24,912</td>
</tr>
<tr>
<td>1985</td>
<td>344</td>
<td>61,916</td>
</tr>
<tr>
<td>1986</td>
<td>328</td>
<td>59,249</td>
</tr>
<tr>
<td>1987</td>
<td>339</td>
<td>52,518</td>
</tr>
<tr>
<td>1988</td>
<td>358</td>
<td>61,246</td>
</tr>
</tbody>
</table>


The federal government spent 358 and 910 million dollars on agricultural extension and research respectively in 1988 (F.A.O., 1989). This was 0.29 and 1.49 percent of total annual recurrent expenditure of the U.S. Department of Agriculture. In general, U.S. government made an adequate investment to the agricultural sector. There had been substantial investment in agricultural research to produce technological improvements which have resulted in dramatically higher crop yields.
Private sector involvement in the agricultural sector was highly significant in the U.S. The cooperative extension service worked in cooperation with private research organizations. Van Den Ban (1988) mentioned that private industry invests more in agriculture than government in the U.S. Much of this private research aims to develop a unique product which can be protected by patents and sold. New pesticides, farm machinery, plant varieties, etc., improve the competitiveness of the firms concerned. Many private firms and farmers' cooperatives in the U.S. have their own extension staff. Thus, private sector involvement in the agricultural research area was another source of finance for agricultural development.

**Adequate Human Resources**

In general, it was found that the cooperative extension service had adequate human resources. The cooperative extension service was a unique structure and different from other extension systems in terms of extension agent/farm family ratio that was widely used to assess the capacity of an extension system to serve its clientele, especially in less developed countries. Farmers in less developed countries, including Burma, were largely illiterate making it necessary for extension workers to depend almost entirely on personal and group contact methods. However, American farmers were highly literate. They subscribe to farm journals and have radios and other telecommunication systems making it possible for American extension
workers to reach great numbers of farm families by mass media methods. Therefore, the number of extension agents ratio was more important in Burma than in the U.S.

Furthermore, the cooperative extension service had highly qualified extension workers. For example, a college degree in Agriculture, M.S. minimum was a requirement now for position as county agent in the state of Ohio. Over the years, educational requirement for employment in the U.S. extension system have been increased. All professional positions required a four-year college degree, with most program specialists and many administrative positions requiring graduate degrees (USDA, 1980). Many state extension staff members with advanced degrees had joint appointments in trading, research and/or extension. Staff with advanced degrees generally understand other researcher's work more effectively and transform it into information that communicates effectively with clients. Table 28 shows the level of academic degree indicating most of extension workers in the U.S. were highly qualified. Most of the development of subject matter for the planning and conduct of extension programs was done at the state level, chiefly by the state agricultural experiment station. It was at the state level that the linkage between research sources and extension program planners was most critical.
Table 25
State Extension Staffing by Level of Academic Degree (1978)

<table>
<thead>
<tr>
<th>Program Area</th>
<th>Number</th>
<th>Highest Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and Natural Resources</td>
<td>3,371</td>
<td>1962 1,129</td>
</tr>
<tr>
<td>Home Economics</td>
<td>1,183</td>
<td>35 390</td>
</tr>
<tr>
<td>4-H Youth</td>
<td>401</td>
<td>88 308</td>
</tr>
<tr>
<td>Community and Rural Development</td>
<td>390</td>
<td>214 176</td>
</tr>
<tr>
<td>Total</td>
<td>5,345</td>
<td>2299 2003</td>
</tr>
</tbody>
</table>


In addition, the cooperative extension service had 22 percent of subject matter specialists in 1982 (Warner & Christenson, 1984) and most county extension educational programs were assisted by the volunteer service. That was one of the beauties of American extension system. According to Warner and Christenson (1984), there were 1.3 million unpaid local volunteer leaders in the average helping agents. So the agent/farm family ratio was not important for the cooperative extension service.

According to F.A.O. 1989 Survey Report the cooperative extension service had a well established personnel management procedure. There were written and distributed job descriptions, evaluation procedures
and criteria. There was an annual written evaluation on each staff member. Extension field personnel were notified of evaluation results with follow-up counseling or training when needed.

Program Development Procedure

Extension was a national resource and historically it had focused on program development and implementation. The cooperative extension service had conducted educational programs designed to result in the development of skills, attitudes and understanding of people as it had already established program development procedures. Extension programs were always built on the basis of the procedures and principles. Kelsey (1963) described the following ten principles that the cooperative extension service followed.

Extension program building

(1) is based on analysis of the facts in the situation,
(2) selects problems based on needs,
(3) determines objectives and solutions which offer satisfaction,
(4) has permanence with flexibility,
(5) has balance with emphasis,
(6) has a definite plan of work,
(7) is a continuous process,
(8) is a teaching process,
(9) is a coordinating process
(10) provides for evaluation of results.
Although the programs were developed at the local level, they must conform to four program areas. Originally, the cooperative extension service focused on agriculture and home economic subjects in primarily rural areas. However, the range of programs offered and audiences served by the extension services had broadened substantially, especially during the past two decades (Warner and Christenson, 1984). The extension service was active in rural, urban and suburban communities and the programs carried out by the cooperative extension service included social and economic problems and cultural, recreational and leisure-time activities as the demands for extension service programs were great (G.A.O. Report, 1980). Its service had been an important role in the development of the rural America. It had served the public outside the Land-Grant Colleges with special concern for agriculture and rural families for over 70 years. The growth of agriculture and economy of the U.S. resulted from the development of agricultural educational programs through cooperative extension service (Warner and Christenson (1984).

**Extension Delivery Methods**

In the U.S., the scientific methods were applied by farmers that were delivered by the cooperative extension service through different extension strategies. Extension always provided information to farmers to assist them in solving their production and management problems. Farmers were made aware of new technologies through
demonstrations, field tests, and experiments to evaluate the applicability of new techniques and varieties to local conditions, to develop minor modifications to fit local needs, and to develop educational programs to help farmers learn the practical value of these techniques and to encourage their adoption.

The methods used by the cooperative extension service to transfer information, develop leadership activities, and perform other functions to reach and serve clientele included mass media bulletins and publications, meetings, demonstration plots, tours, individual office and farm visits and calls, and guided participation in organizational meetings and other leadership development activities. In the U.S., extension staff and activities were a primary direct source for technical production information for farmers; but farm magazines and agribusiness sources also ranked high. For marketing information including prices, mass media outlets, dealers, elevator operators, salespersons, and buyers were the primary sources. Information on daily weather report, commodity markets, prices, news, newsletters, planting recommendations, pest control information and all kinds of news related to agricultural development were given to farmers through mass media. Radio, television and newspapers relayed significant amounts of extension information as there were many radio and television stations and newspapers in the U.S. and there was no government control on mass media. Nowadays, the farmers in the U.S. live in and were a part of communication/media-information age.
Today, a sizeable number of farmers have computers that can access agricultural information from already existing private and public data banks. According to data collection results in Ohio State, ten percent of Ohioans own personal computers, 9.4 percent have a satellite dish and 80.8 percent own a videocassette recorder (OCES, 1987). Beal (1989) reported that the average farmer took 2.7 farm-related papers or magazines and more than 60 percent listened to agricultural radio programs or accessed farm information daily. In the U.S., there was more than one radio per person (Axinn and Thorat, 1972). The extension service had arrangements with radio stations whereby the stations provide broadcast facilities and air time to the extension agents for farm programs. A large number of radio stations have full-time radio farm directors who produce materials to be broadcast. In addition to radio, television, newspapers and printed materials, the cooperative extension service used advanced mass media such as telecourses, teleconferencing, videotex, teletext, etc. Teleconferencing was one of the newest and most rapidly adopted means of extending information to a group. It made use of existing communication links and was available to anyone with access to a telephone. With its emphasis on efficiency and productivity, teleconferencing became widely adopted in the U.S. especially in adult education in rural areas (Waldron et al., 1984). Technology dissemination was very effective and efficient due to utilization of
different mass media by extension and most farmers own radio and television.

According to Fay (1962), it was estimated that American extension agents each year:

(a) make 20 million personal contacts by farm visits, office calls and telephone calls,
(b) contact 75 million individuals in group meetings,
(c) train one million local leaders
(d) release 900,000 educational news stories,
(e) give 165,000 radio talks and
(f) distribute 23 million bulletins.

This information indicated that the cooperative extension service today will have more extension educational activities than before 1962, and it had an excellent technology dissemination system or extension delivery methods.

Time Allocation to Educational Duties

Historically, U.S. extension had meant education in agriculture and in home economics for rural people. This education was a practical education, aimed at improving farm and home skills. The main duty of the cooperative extension service was to undertake educational activities. It was not responsible for distributing agricultural inputs like the Burmese extension system. However, according to the F.A.O. 1989 Survey Report, each field officer, on the
average, had to spend 10 percent of total working time on non-educational activities. The data show that cooperative extension service had allotted much more time on educational activities while Burmese extension workers spent much more time on non-educational activities.

Technology Utilization

Government pricing policy or farm policy, availability of credit and access to physical inputs were considered, in this study, to be associated with technology utilization. In the U.S., the government does not control any agricultural commodities. All commercial businesses were operated by private sector. This was a great difference between Burmese and American extension system.

In general, farm policy provided a favorable and profitable climate in which the U.S. farmer could operate. This included a multitude of parity, price-support, subsidy, and stabilization programs. Favorable crop insurance, credit, land, and water policies were available, plus other favorable policies dealing with transportation, communication, rural electrification, mail service, and taxes. Therefore, U.S. farmers did not have any problem with the availability of credit and physical inputs such as seeds, chemical fertilizers and pesticides. These factors have contributed to the success of technological diffusion and acceptance in the U.S. Due to technology utilization by farmers, there had been large increases in
agricultural production. Most of the large increases in agricultural production in the U.S. have been due to yield increases per unit area of land by applying technology, with little contribution provided by additional land. In Table 26, from 1940 to 1980 the index of total farm land remained about the same, while agricultural output more than doubled. Japan has had similar experience. Agricultural land index in 1940 and 1980 in Japan was 101 and 90; while agricultural outputs in these years were 71 and 146.

Table 26
Large Increases in Agricultural Production with Little Change in Land Farmed in the U.S.

<table>
<thead>
<tr>
<th>Year</th>
<th>Agricultural Land Index</th>
<th>Agricultural Output 1960=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>46</td>
<td>29</td>
</tr>
<tr>
<td>1900</td>
<td>73</td>
<td>46</td>
</tr>
<tr>
<td>1920</td>
<td>83</td>
<td>53</td>
</tr>
<tr>
<td>1940</td>
<td>94</td>
<td>68</td>
</tr>
<tr>
<td>1960</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>1980</td>
<td>97</td>
<td>146</td>
</tr>
</tbody>
</table>


Monitoring and Evaluation

All extension programs carried out by the cooperative extension service were evaluated to assess the impacts of the programs and for
further improvements. The cooperative extension service had established monitoring and evaluation procedures so that regular formative evaluations were made to make necessary corrections during the implementation period of the program. At the end of the program, summative evaluations were made to know the achievement of the whole process and to extend the valuable experiences gained to the future programs. Most extension educational programs were effective because of proper monitoring and evaluation procedures developed and applied by the cooperative extension service.

Summary of Major Strengths and Weaknesses

One of the major organizational problems in less developing countries, including Burma, was the hierarchical set up in agricultural extension services which was combined with strong centralization in decision making. Generally, an extension organization was ministry based. One of the problems of excessive centralization, from the researchers' experience, was inconvenient delays in providing the funds and staff required at the township level when supports were needed for season-related activities. In contrast, the cooperative extension service in the U.S. was university based and it had autonomy that allows more adaptability and flexibility in dealing with local problems. A unique feature of the cooperative extension service was its degree of decentralization in decision making. This decentralized decision making structure was an important
factor influencing the extent of local support. One of the strengths of the cooperative extension service was that the federal grants have not been the medium of federal control of state or local government. Counties in the U.S. were the basic local units for extension services and have much more independence and more financial responsibility than the local government units (township levels) in Burma.

The government farm policies and regulations were relevant to agricultural production. Although the government was changed, the next new government will not change or abolish the previous policies, regulations or activities that were good for the people and country. The existing policies, regulations or activities may be improved or modified for the benefit of the country without any personal bias while the new government in less developing countries frequently changed totally or abolished the previous policies and regulations made by the former government or authorities, regardless of the goodness or the badness for the country, due to personal bias. As the U.S. extension workers of the cooperative extension service were staff members of the Land-Grant institutions, they were free to carry out extension educational programs without influence by political interests.

The major strength of the U.S. cooperative extension service was a strong linkage between research and extension. Due to close cooperation and coordination of the U.S. Department of Agriculture and Land-Grant institutions in which agricultural extension and research
have been built, together they have contributed much to the growth of American farm technology. Cooperation among the individual Land-Grant Colleges and between them and the U.S. Department of Agriculture provided a unique pattern that can be regarded as a model for effective State-Federal cooperation in many scientific endeavors. The main functions of Land-Grant universities were teaching, research and extension.

In the U.S. Land-Grant models, all institutions were independent, less bureaucratic compared to those of less developed countries. In all American universities, the right to determine entrance requirements, length and content of courses, required courses leading to different fields of specialization, teaching procedures, curriculum development, and examinations was left to the individual university or college. In most less developed countries, there were many directions and instructions from different levels of government, professors or chairpersons of the departments have no right to make decisions for academic areas, and all cases must go to the higher authorities for final decision.

Universities and colleges of agriculture obtain funds for training and research from different sources including private sector. The private sector made greater financial investments in agricultural sector than government in the U.S. (Van Den Ban 1988). Most of these private organizations have been highly complementary to extension and frequently carried out parallel education, demonstration and service
programs to aid farmers in reaching their production, marketing and profit goals. Private sector involvement in the agricultural sector helped the cooperative extension service in terms of financial, technical development and dissemination support. Murphy (1984) stated that about two thirds of the agricultural research was done by the private sector in the U.S.

The educational level of extension personnel was a very important factor for the overall quality of the extension organization and with its ability to carry out its mission effectively. As there were adequate highly qualified extension workers in the cooperative extension service, it had greater capacity to carry out extension duties, fulfill responsibilities and educate farmers.

The cooperative extension service had well established personnel management procedures. The quality of supervision and performance evaluation was very good and included follow-up counseling and training (F.A.O., 1989). The application of proper personnel management procedures was one of the major strengths for an effective and efficient extension system.

The cooperative extension service had established program development procedures for years and it had been improved as necessary. People participation was an important element of program development process. The people in the U.S. were encouraged to participate in program planning, in examining needs and opportunities and in the implementation of the programs. In the U.S. extension
system, there was a two-way flow of information and feedback between the farmers and the extension services. All extension programs used a bottom-up approach. This approach resulted in the achievement of the general goal of the extension process that was to enable people to use knowledge, skills and information to improve their quality of life.

In addition, the support of farmers' organizations and committees was another strength of the U.S. extension system. In the U.S., farmers have organized themselves in many different ways to serve their collective interests. Farmers' organizations such as Farmers' Union, Farm Bureau, etc., have played important and usually positive roles in the lives and businesses of U.S. farmers. This influence was particularly apparent in areas such as political and legislative pressure, marketing, farm supply, credit, educational programs and social activities. Farm cooperatives have and continue to be very important for agricultural development activities.

One of the major strengths of the cooperative extension service was that it can utilize a variety of communication channels, ranging from nationwide radio broadcasts to satellite programs to deliver technical information for farmers. The extension workers in the U.S. today live in a world where machines such as microcomputers of varying complexity help them perform their duties more interestingly and efficiently and with less physical effort than at any time in the past. Probably the most important farm input in farming today was information. For many years, the main sources of production and
marketing information for clientele have been letters, farm magazines, meetings, radio and television. The current breakthroughs in communication processes in combination with computers now in the U.S. make the cooperative extension service possible for clientele to have ready access to good up-to-date information. This information can be retrieved quickly and efficiently and may be customized to suit each individual producer's use. The introduction of new information technologies can save time, costs and increased efficiency in advising and educational work, for instance, U.S. farmers can assess the milk production rate with different types of feeding by using computer programs.

Nowadays, satellites are used increasingly for the delivery of education and learning experiences. Most of U.S. farmers have been using satellites to receive televised educational television programs. So farmers in the U.S. were kept well informed by the cooperative extension service about new development in production technology and market.

Extension workers of the cooperative extension service concentrated their efforts on bringing to the farmers the latest scientific methods of producing crops and livestock. The prime function of extension workers was to carry out educational activities as distribution of agricultural inputs was not the duty of cooperative extension service.
Appropriate and advanced technology recommendations can be developed for the needs and interests of farmers as there were a lot of technicians in different areas. Furthermore, private firms played a major role in promoting technological change. In the U.S., a large amount of information was provided to farmers by seed producers, chemical suppliers and processing firms. In addition, most of the Land-Grant Colleges have extension editors whose business is, among other things, to set up a regular service of news for the press on a state-wide basis. Land grant universities also produce extension bulletins and other printed materials, for instance, Ohio cooperative extension service, The Ohio State University produced 1027 different kinds of bulletins in 1988 (Table 27). This was one of the major strengths of the cooperative extension service to produce extension outputs required for the transfer of technological information to farmers.

Another strength of the cooperative extension service was that it was easy for U.S. farmers to access production technologies as there were several links between the farmer and the researcher; for example,

(a) Extension agent serves as a two-way link between farmer and researcher,

(b) Researchers go directly to the farmers to understand their needs and to decide what research they can do,

(c) Farm organizations such as Farm Bureau serve as a link between farmers and research organizations and

(d) Farmers can go directly to the researchers to obtain technological information as they were also tax payers.
Table 27
Extension Bulletins produced by OCES in 1988

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Number of Bulletins Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Economics</td>
<td>43</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>65</td>
</tr>
<tr>
<td>Agronomy</td>
<td>19</td>
</tr>
<tr>
<td>Animal Science</td>
<td>191</td>
</tr>
<tr>
<td>Community &amp; Natural Resource Development</td>
<td>86</td>
</tr>
<tr>
<td>Dairy Science</td>
<td>61</td>
</tr>
<tr>
<td>Entomology</td>
<td>51</td>
</tr>
<tr>
<td>Plant Pathology</td>
<td>27</td>
</tr>
<tr>
<td>4-H</td>
<td>199</td>
</tr>
<tr>
<td>Home Economics</td>
<td>183</td>
</tr>
<tr>
<td>Horticulture</td>
<td>45</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>40</td>
</tr>
<tr>
<td>Poultry Science</td>
<td>4</td>
</tr>
<tr>
<td>Computer Programs</td>
<td>13</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1027</strong></td>
</tr>
</tbody>
</table>

*Source: Ohio Cooperative Extension Service: The Ohio State University, April, 1989.*

Farmers in lesser developed countries, including Burma, could not easily access agricultural credit and physical inputs in relation with technological utilization. However, in the U.S., there was a relatively well developed commercial infrastructure in the form of
private-individual ownerships, partnerships, corporations and cooperatives. This provided high-quality, reasonable priced, readily accessible farm inputs and equally effective marketing and processing structure for the success of U.S. farmers.

**Weaknesses**

The U.S. Land-Grant Model has been in existence for years and works well in the U.S. The Model was, in part at least, responsible for the surplus food production in the U.S. and America's food abundance was due to the contributions of Land-Grant universities to agricultural production (Thompson et al. 1988). In responding to problems in famine, hunger and food security, many third world countries have attempted to adapt the U.S. Land-Grant Model to their systems of higher agricultural education. Unfortunately, the U.S. Land-Grant Model did not directly fit in less developing countries with different culture and a different political and socio-economic situations (Thompson et al. 1988). Many of the facilities which exist in the U.S. were underdeveloped in other countries especially in less developed countries. Watts and Claar (1983) pointed out that extension programs under U.S. auspices simply should not be undertaken in countries where certain minimal managerial standards and democratic processes did not pre-exist. So the cooperative extension system of the U.S. Land-Grant Model cannot be applied directly in other countries.
One of the weaknesses of the cooperative extension service was inflexibility of staff/system. Some faculty members who were in the position of joint-appointment might have difficulty with their tenure.

Funding and allocation of budget was one of the major issues for the cooperative extension service. Hightower (1972) has argued that public investment in agricultural research has not always been spent with the needs of small farmers. Allocation of funds often was based on expressed needs of more influential large, commercial farmers who often hold nonagricultural jobs in the society. Heady (1973) also argued that this tendency was present in agricultural research at some of the landgrant universities in the U.S.

According to Warner and Christenson's study in 1984, the extension programs hardly met the needs and satisfaction of rural non-farm residents and lower socio-economic status individuals. They reported the greatest dissatisfaction was among persons of low income and education level. As extension was educational in nature, a voluntary educational program was more likely to appeal to persons who can understand and utilize the information content of the program. So a minimum level of educational proficiency and economic flexibility was required to have maximum benefit of extension programs and satisfaction with extension.

The range of programs offered and audiences served by the extension service has broadened substantially due to changes in economy, technology, society, politics and culture, etc. Extension
has served the needs of different types of people in the U.S.; consequently, the type of extension agent needed to do extension work was questionable, whether an extension agent should be specialist or a generalist to meet the changing needs and to satisfy people with increased demands for extension service. According to Warner and Christenson's study, it was found that county staff sometimes cannot meet the local needs as more specialized and detailed technical expertise were required. So, it becomes an important issue for the cooperative extension service whether it should stress establishing program priorities, who was extension's clientele and whether extension agents should be specialists or generalists.

Description and Analysis of Farming System Research and Extension (FSR/E)

Farming system research has become increasingly important as an element of the research programs of the international agricultural research centers, national research programs and development projects with agricultural research components since it evolved in the post-Green Revolution era. Farming system research was concerned about small farmers. Researchers at the international agricultural research centers recognized the following socio-economic characteristics of small farmers (Collinson, 1982):

a. small farmers were poor and have little ready cash;
b. loans to them were usually unavailable or expensive;
c. they were conscious of an uncertain environment, of cash shortage and of family responsibilities and therefore
d. they were risk-averse,
e. they were economically rational but not necessarily profit-maximizing because
f. they were their own scales of utility;
g. they live in countries in which the social infrastructure of markets, supplies and communications was often weak and not to be relied upon.

Scientists have recognized that "improved technology" has often been developed under controlled conditions on experimental stations, which were very different from those that farmers actually face. Most research work in the past were the location-specific nature. The agro-climatic conditions in most countries were very heterogeneous. What worked in one area might not work in another. So researchers became aware of on-farm adaptive research. In farming system research, researchers could experiment on plots located in farmers' fields. This approach basically tested a technology's response to a wider variety of agro-climatic conditions. At the same time, the farmers could do experiments with researchers' prescription of some practices, while farmers did the remaining work themselves in largely traditional ways. Then the researchers evaluated the technology's performance under these conditions. Finally, a proven technology was transferred to other small farmers by extension. This was the basic
philosophy and methodology of farming system research and extension (FSR/E). There were five basic activities in the FSR/E as explained by Shaner (1982). These five components were as follows, Figure 6.


**Figure 6 - The five basic activities of on-farm research in FSR&D**
Target and Research Area Selection: (Site Selection)

The FSR/E approach typically used interdisciplinary teams and the team composition varies according to the task and variable staff. This team aids national decision makers in selecting target areas and target groups of farmers. Then the team divides the target areas into subareas on the basis of common characteristics and establishes the boundaries of the research areas so that the team was able to develop improved technologies for farmers operating under similar conditions throughout the target area. The number and locations of research areas will be selected throughout a country depending on FSR/E goals and resources and the characteristics of the areas.

Problem Identification and Development of the Research Base (Diagnosis):

After the research area was selected a survey team consisting of different disciplinaries took information to describe the conditions under which farm households might accept new technology. This was what FSR/E called diagnosis.

Planning On-Farm Research (Design)

The research team begins the research design and planning activity by 1) reviewing the priorities given to problems and formulate hypotheses for solution; 2) reviewing previous findings; 3) seeking whatever help was needed and available from regional, national and
international sources. During the planning stage, the team worked collaboratively with farmers in their fields. In this way, a solid base was developed for the team to understand farmers' conditions and to design and implement appropriate experiments. The team also designs record keeping and monitoring systems. Before finalizing the research plan, the team makes a preliminary analysis of possible impacts of the proposed technical changes on the farmers and environment.

On-Farm Research and Analysis: (Research)

FSR/E tested hypotheses about what new technology might be acceptable (interventions) through on-farm trials. This was what FSR/E called testing. The team commonly conducted three types of biological experiments: 1) researcher-managed trials; 2) farmer-managed trials; and 3) superimposed trials. Then the results were analyzed. FSR/E documented all conditions of the testing of a hypothesis about what technology might be acceptable to farm households. These conditions included biological, economic and social conditions. This was part of the testing. Documentation involved recording measurements and observations during the on-farm trial. Accepting or rejecting the hypothesis was based on the results of the testing. FSR/E drew conclusions about the hypothesis by using the data set obtained from testing according to the plan (experimental design). This was the last step of the testing. The systematic
method which FSR/E used to accept or reject a hypothesis consisted of a series of analyses of the data set:

(a) Biological analysis based on comparison of:
   (1) the effect of the intervention: the difference between the intervention and current farm household agricultural production technology and
   (2) random variations that always occur in agricultural production.
(b) Economic analysis based on comparison of the costs and benefits of the intervention versus current farm household agricultural technology.
(c) Social analysis based on comparison of who pays the costs and who receives the benefits from the intervention versus current farm household agricultural production technology.
(d) Acceptance or rejection of hypothesis that the intervention will be acceptable based on integration of the three types of analysis: biological, economical and social.

FSR/E used a sequence of trials to reproduce the test of intervention. FSR/E does not make a conclusion about whether an intervention will be acceptable to farm households based on only one on-farm trial. FSR/E used farm household members to reproduce the test. Members conduct the test entirely on their own at the end of the sequence. This was called validation testing. Farm household
members were key persons to determine the acceptance of new technologies.

Extension of Results (Extension).

The results of the same test obtained by different people was compared. In FSR/E, if farm households obtain the same results in validation testing as research and extension personnel obtain in earlier on-farm trials, action was taken on the consensus: the intervention was promoted as a recommendation for all households with similar conditions. This was what FSR/E calls extension.

FSR/E considers negative results of on-farm trials to be positive, valuable information. Research and extension personnel on an FSR/E team use this information to design new trials to test new hypotheses. FSR/E calls this interactive diagnosis and design. FSR/E team approach provides a mechanism for research and extension personnel from different disciplines to become a scientific community for determining the expected responses of farm households to new agricultural technology.

A key feature of FSR/E was its interdisciplinary nature and local support of an FSR/E project was vital to its success. Local leaders/influentials were an important component in obtaining local support and if they were not effectively involved, the FSR/E projects may not be successful. One of the distinguishing features of FSR/E was its need to operate at the community level. Getting to know the
local community within which an FSR/E team will be working was very important. Under the traditional approaches to research and extension, most research to develop technologies was conducted on experimental stations. The technologies were then given to an extension service which promoted them among farmers. For FSR/E approach, the FSR/E team conducted research in farmers' fields as well as on experiment stations. At all stages of the approach, research was conducted in the community involving extension agents, researchers and farmers. Therefore, the FSR/E team had to secure and maintain the endorsement of local leadership and the local farmers in the community.

Analysis of Farming System Research and Extension

FSR/E approach to agricultural development placed more emphasis on research. There was a strong linkage between research and extension according to the system developed.

It requires a system of multidisciplinary teams in the fields such as agronomist, economist, entomologist, rural sociologist or animal science specialist, etc., according to the types of FSR/E programs and the availability of staff. The principal groups were teams at the field, regional and national levels. Interdisciplinary was one of the main characteristics which differentiated FSR/E from other approaches to research and extension.

Financial support was much dependent on the donor agency and host country's situation where FSR/E was going to be carried out; for
example, World Bank introduced FSR/E system in many African countries by providing funds and other facilities.

FSR/E needs some professionals of specific areas to form a team. Some problems may arise with FSR/E system as most less developed countries lack adequate human resources. If there were sufficient human resources, the system will work well in that particular country.

Regarding program development procedure and people involvement, the system has an integrated approach to on-farm research development, followed by extension. Its aims were to encourage participatory research by farmers on trial plots and the system allowed farmers to participate in the planning stage as well. The system incorporated a concern to reach small-scale farmers. It concentrated its efforts on problems identified on site-selected farms in target areas, seeking to understand the farmers' situation first hand. Local leaders, influentials and farmers played important roles in FSR/E diagnosis, planning, implementation, extension and evaluation along with interdisciplinary team, research and extension workers.

Regarding technology development, agricultural research and development along with extension activities took time before they began to be advanced as national systems.

FSR/E did not have a unique systematic method for extension. It used techniques that were basically similar to the methods used by extension personnel to promote recommendations of other extension systems. The difference was in the systematic method that FSR/E used
to generate the recommendations for farmers. FSR/E system consisted of monitoring and evaluation procedures for program or research activities.

Summary of Strengths and Weaknesses

Strengths

1) The farming system research approach started with the farmer and provided a link between the research institution and funding agency, thus counterbalancing the more conventional "top-down" experiment station research approach.

2) FSR/E was introduced for small farmers to increase food production in less developing countries where food was a major problem. FSR/E system included a mechanism for effectively linking research and extension institutions and their activities. It offered new opportunities for integrating research and extension for generating and diffusing improved technologies.

3) Farming system research was a unique and potentially significant approach that could greatly increase the effectiveness of agricultural research and development programs in less developed countries where small farmers were farming. FSR/E system concentrated on these small farmers who were the major portion of the world population.
4) Farming system research and extension system had a multidisciplinary team of researchers, farmers and extension workers interacting at the local level. Involvement of the local community and farmers improved accuracy and usefulness of information.

5) FSR/E identified farmers' needs and objectives. An attempt was made to understand the farmer's objective in the initial descriptive or diagnostic stage. The objectives of the farmers were directly incorporated into the designing and testing of strategies.

6) FSR/E approached views farmers both as individuals and as members of the large community and society. Thus, the approach linked the micro perspective with broader societal considerations in the process of designing development strategies. Such strategies might involve single innovations proposed for adoption by farmers such as improved seeds or fertilizer used. Societal goals could include maintaining soil fertility to enable the land resources to be used by future generations, avoiding an increase in inequality of income distribution and other goals.

7) FSR/E put more emphasis on on-farm research rather than station-based research by using multidisciplinary teams.

8) Recommendations were developed in a participatory manner involving farmers, extension workers and researchers as a problem solving team.
9) Technology recommendations developed through FSR/E were based on actual farmers' problems and were thus more appropriate to small farmers' needs.

Weaknesses

1) To be effective, the FSR/E required strong linkages with existing institutions that were specifically responsible for such matters, including a planning ministry, Ministry of Agriculture and Natural Resources and universities, etc. Generally, less developed countries lack such kinds of coordination and cooperation among the ministries and government departments.

2) Availability of resources, particularly human resources, was a limiting factor for carrying out FSR/E programs in less developed countries.

3) Farming system research had its institutional roots in the agricultural research institutes. Thus, it had a bias toward bio-technological modifications in farming systems. International agricultural research centers failed to pay attention to mechanical technology such as the development of small farm machinery for small farmers.
4) Non-technical factors such as markets, pricing policy, institution and infrastructure were also important to carry out an effective FSR/E program. The system seems to be weak to pay more attention in these areas. Effective FSR/E activities may require close links with strong commodity and disciplinary agricultural research programs.

5) If extension was not made an effective part of farming system research, the long-term results will be disappointment with the impact received from farming system research and a denial of its relevance in terms of technology application at the farm level.

6) The research done by the team was often aimed at meeting professional standards which were more compatible with the resource base and institutional structure of developed than less developed countries. Furthermore, there has sometimes been a concentration on academic research of purely scientific interest rather than on farmers' production problems.

7) Multidisciplinary efforts have sometimes failed because the teams were organized as committees, meeting occasionally to "coordinate" efforts but normally functioning along disciplinary lines. Thus, Hildebrand (1978) claims that the result of the meeting may not be a single product but a series of products which were never integrated before they reach the farmer.
8) In order to make the technology more relevant to farmers' needs, increased communication between lower-level researchers and farmers was necessary. The most important factor in improving communication between farmers and researchers was through strengthening the linkage between the research agency and extension service. Generally, there was no linkage between research and extension in most less developed countries. Under such conditions, FSR/E system would not work very well.

9) FSR/E was often regarded as costly and time-consuming.

10) The adoption of new technology depended mainly on the goals of decision-makers, usually small farmers. The inconsistency of "improved technology" with farmers' goals often explained the low adoption rate.

Description and Analysis of Training and Visit System

The Training and Visit (T & V) system was developed by Daniel Benor and was widely introduced in the late 1970s in Asian and African countries with the financial assistance of the World Bank. Benor developed the T & V system as he felt that "most existing extension systems in developing countries have been poorly managed and disorganized, and depend on poorly trained and motivated extension agents; consequently, knowledge has not been effectively transmitted both ways: from research to farmers and no feedback from farmers to research (Benor and Cleaver, 1989)
Objective

The main objective of the T & V system was to improve the level of agricultural production by large numbers of small farmers cultivating mostly small farms using low level technology and usually traditional methods. The principal guideline of the system was to equip the Village Extension Workers (VEW) with the ability to fill the information gap necessary to help the farmer maximize crop outputs and profits. Thus, the T & V system aims at building a professional extension service that was capable of assisting farmers in raising production and increasing incomes and of providing appropriate support for agricultural development.

Organization

The entire T & V organization was based on the total number of farm families and the number of families which one VEW can reasonable expect to serve. If the number of farm families for one VEW to manage was determined, the total number of VEWs required to cover a given project area was easily calculated. The recommended ration of extension agents to farmers under the T & V system was 1:800. In addition, according to the T & V system the extension workers must only fulfill extension-related functions. The organization was further arranged so that an Agricultural Extension Officer (AEO) guided, trained, and supervised about six to eight VEWs. In turn, six to eight AEOs were guided and supervised by a subdivisional Extension
Officer (SDEO). The SDEOs were supported by a team of Subject Matter Specialists (SMS). Some four to eight SDEOs were supervised by a District Extension Officer (DEO) who was also supported by SMSs. Depending on the number of districts, the DEO was supervised either directly by the extension headquarters or an intermediate supervisor, for instance, Zonal Extension Officer (ZEO). Figure 7 shows the organizational pattern of the training and visit system of agricultural extension. The objective of the organizational pattern was to ensure that each level of the service has a span of control narrow enough to afford close personal guidance and supervision of the level immediately below. Therefore, there was a single line of command from the government agency responsible for agriculture to the field-level.
Figure 7 - Organizational Pattern of the Training and Visit System of Agricultural Extension. (From: Benor, Harrison and Baxter. (1984) Agricultural Extension. The T&V System. P. 3.)
Methodology (Extension Strategy)

Generally, T & V methodology involved the transfer of technology by stages from the researchers to the farmers. The researchers trained SMSs, who in turn trained Village Extension Workers (VEWs). VEWs received regular fortnightly training in those specific agricultural practices and recommendations that related directly to farm operations during the coming weeks. VEWs then went to villages on a regular schedule to give groups of "contact farmers" specific recommendations on cultural practices. Contact farmers received technical information from VEWs and they have to report back to other farmers what they learned from VEWs. Benor (1984) proposed that extension agents try to serve all farmers, particularly small farmers. He suggested that each extension agent work directly with six to eight village extension workers, which were government employees. Each of these VEWs would work with eight groups of the farmers, each group involving from 300 to 1200 families depending on circumstances. In each group, about 10 percent of farmers (i.e. 30 to 120) were selected as contact farmers. The VEW would then have a rigid schedule of visits with each group and its contact farmers once fortnightly, always at the same time (example every Monday). Then, one day a week the VEWs would receive specialized training from SMSs. This training was based on analyses of the Village Extension Workers' experiences in the past two weeks. Training was usually given for groups of two or three AEOs with their VEWs. Each AEO also met with
his/her VEWs every two weeks to discuss organizational administrative matters. Every month the SMSs met with research workers to discuss agricultural production problems for the next month. These meetings (workshops) also served as training for the SMSs.

**Duties and Functions**

Although every level of staff in the T & V system had duties and functions, the following were key positions and their main functions.

**Village Extension Workers (VEW)**

The VEW was the only extension worker who teaches production recommendations to farmers. The responsibility of all other extension staff was ultimately to make the VEW more effective in his/her field. The main responsibility of the VEW was to visit regularly each of the eight farmers' groups of his/her area of jurisdiction and to teach and try to convince farmers to adopt recommended production practices.

**Agricultural Extension Officer (AEO)**

The AEO has to review and assist in the organizational aspects of the job of the VEW and to provide technical support to the VEW. The AEO has to check whether production recommendations were effectively taught to farmers by VEW and VEW pass on immediately to appropriate authorities when he/she has a technical problem with farmers that he/she cannot solve. The AEO was primarily a field worker and spent
his time on monitoring of the VEWs' activities, for instance, to make sure that farmers were being visited regularly by the VEW and that the recommendations they receive were appropriate and were adopted. AEO reviews whether contact farmers have been correctly selected, farmers' groups were properly delineated, and all farmers were aware of the VEW's visit schedule and activities.

**Subject Matter Specialist (SMS)**

The SMS provides technical training and guidance to extension workers. The SMS was responsible for formulation of production recommendations and linkages between research and extension. SMSs have three common functions: 1) to make field visits; 2) to train extension staff; and 3) to take training from researchers.

**Contact Farmers**

Their duty was to help other farmers in their groups and to transmit knowledge learned from the VEW to them.

**Analysis of T & V System**

Under the T & V system of extension, procedures were established to promote and strengthen the necessary linkages between research and extension by means of periodic meetings of research and extension staff in the monthly workshop, and through the training of extension staff by researchers. The aim and objective of procedures set by
T & V system for linkage between research and extension was quite good, but it was entirely dependent on the host country's situation. If a country has already established a strong linkage between research and extension, then the T & V system will work very well, otherwise it was very difficult to operate the system in that particular country.

**Funding**

Adequate government financial commitment to the project area of T & V system was also very important. Financial support was also dependent on the donor agency such as the World Bank and the host country's financial status and its government's agricultural policy. The World Bank usually recommends to apply the T & V system in those countries that were going to receive a World Bank loan for an agricultural development project. Some countries have applied the T & V system but found that it was not very successful as the system does not fit directly to their local conditions. Some countries have financial problems in supporting the extension service after the World Bank departs and, consequently, T & V system was no longer functional due to a lack of resources.

**Human Resources**

Regarding adequate human resources, the T & V system needs well trained persons for SMSs, research organizations and VEWs. To be effective the T & V system, the host country must have sufficient
human resources. The system generally incorporated available extension personnel and other resources, redeploying them in an effective manner. However, the success of the T & V system of extension depended on the state of existing service of the country in relation to personnel and physical resources.

Program Development Procedure

Regarding program development procedure and people involvement, the system had a special training program for VEWs who were going to teach the farmers. On the basis of the farmers' needs and problems identified or reported by VEWs, the SMSs will give training to VEWs developing production recommendations. The major criterion was the ability of VEWs and how well they could communicate with farmers and SMSs or through the AEO. The system did not have a systematic program development procedure as the U.S. Land-Grant system does. The T & V system places more emphasis on increasing production of a particular important crop or crops in a country. SMSs usually tried to develop appropriate production recommendations, usually termed as "impact points" to deliver to the farmers through the VEWs. The T & V system encouraged local farmers to participate in the program by selecting "contact farmers" and allowing "follower farmers" to attend the meetings held by the VEW with contact farmers to transfer technical information for immediate use. The system has a very tight schedule of working with "contact farmers" and other "follower farmers."
Program Delivery Method

Regarding program delivery method, the VEWs taught farmers what they have learned during the training given by SMS. The effectiveness of program delivery method was mainly dependent on the ability of the VEWs. The VEWs regularly visit contact farmers and deliver technical information to them. Contact farmers were expected to train or transfer technical information to other farmers. SMSs, AEOs and the VEWs were all closely involved in farm trial. This was a kind of teaching method.

Technology development or development of specific production recommendations

This was critical in the T & V systems. If an appropriate technology for solving farmers' immediate problem was available, the T & V system would run smoothly and farmers would pay more respect to the VEWs. Generally, some farmers in less developed countries have negative attitudes toward new technology and extension agents due to their traditional beliefs or due to some agents' lack of empathy and credibility. In general, farmers in less developed countries have been reluctant to change their traditional methods of cultivation unless they saw something new by themselves. So the recommendations given by the VEW was very important in the T & V system. If the recommendation given by the VEW failed once, it was very difficult to reorganize farmers again to follow new recommendations. Thus, proven
and correct technology or specific production recommendation must be given by SMS and this new technology must be financially feasible for a farmer, should have minimum risk and high potential income. It was found that some less developed countries could not develop new technology to meet these requirements of small farmers as some recommendations under the T & V system must be very location-specific.

**Time allocation**

Under the T & V system, extension workers must spend most of their time on educational activities; but extension workers in some less developed countries were often responsible for the distribution of agricultural inputs. In such countries, there can be some conflicts among extension workers, and the T & V system may not work very well.

**Monitoring and Evaluation**

According to the T & V system, monitoring and evaluation was done by extension management and monitoring and evaluation unit under the T & V system organization. To do their job effectively, monitoring and evaluation staff must be properly trained, be autonomous from the extension service and have adequate mobility to conduct survey and other work as scheduled. Generally, most existing extension systems in less developed countries lacked these facilities and the extension systems did not have sufficient well trained persons to monitor and evaluate the programs. Therefore the success of the T & V system
entirely depended on the situation or existing extension system and the government policy of the host country. Instituting the T & V system cannot be accomplished overnight. The commitment of the government to extension reform was a major asset in less developed countries.

Summary of Strengths and Weaknesses

The T & V system emphasizes simplicity in organization, objectives and operation. It has a well-defined organization with a clear mode of operation. There was a single, direct line of technical support to, and administrative control of, their staff. Everybody knows who his supervisor was and what he/she was expected to do. The supervisor (AEO) visits the VEW regularly to check the VEW's work and to help him/her do it better. Under the T & V system, schedule of work, duties and responsibilities were clearly specified and closely supervised at all levels. The number of farm families per the VEW was set at a manageable level. The T & V system was a relatively simple technique requiring little or no cost increase in inputs. It concentrated its efforts only on the major crops to increase production through relatively simple techniques of better crop husbandry. The system aimed at reaching large numbers of farmers quickly with advice covering the entire production cycle.

The T & V system used village-level extension workers with comparatively low educational preparation supported by subject matter
specialists and provided close supervision through a management structure which established a clear line of responsibility. The linkage between research and extension was strengthened by joint field visits by the researchers and SMSs, regular training sessions and workshops for extension and research personnel and visits by extension staff to research stations. The T & V system provided continuous feedback from farmers to research and extension. So, it could make adjustments to meet farmers' needs during the training course.

The T & V system was farm and farmer-oriented and extension workers could concentrate on extension work only as they were not responsible for distributing agricultural inputs.

The system provided many opportunities for extension workers who have technical competence in production technology. There was a continuous agricultural training for all staff in the extension service in order to increase their professionalism. SMSs who provided the main training to the VEWs also received regular and frequent training from agricultural research staff and from other specialists.

The T & V system has monitoring and evaluation procedures. The management system which relied on a fixed routing for farmers, extension staff and their supervisors ensured that the VEWs actually visit farmers. This was done through frequent field visits by higher level officers and SMSs. If there was no impact of extension, or worse, if the VEWs were not visiting farmers, this was quickly apparent. One can then determine the caused such as poor messages,
poor training, no supervision of agents, etc. Then remedies were
taken by authorities concerned.

**Weaknesses**

The system was named the "Training and Visit" system because
training and visiting were set according to rigid schedules. The
recommendations were very specific and programs were fixed. The
specific recommendations might not be applicable to all project areas
due to difficult agroclimatic conditions and heterogenous soils.

T & V system has a top-down, rather inflexible schedule. It does not
adequately encompass local social organizations and farmers
participation in decision making. It created rigidity in
farmer-extension worker interaction because of its insistence on
frequent, regularized contact. Time adjustment was a big problem for
rural small farmers as they also have some other activities.

Training sometimes was not relevant to the actual practices of the
farming population in specific areas.

One weakness has been that information transmission through too
many individuals before it reaches the farmer, and thus loses
precision. In carrying out the T & V system in some less developed
countries, problems have arisen from a lack of production new
technologies to introduce/recommend. Technology must be available to
carry out the T & V system in any country. So, the T & V system
worked well only in higher potential areas in the world where
communication was well maintained between farmers, extension workers and research personnel.

According to the World Bank experiences, some extension personnel did not visit the farmers regularly because they were engaged with too many activities, lack of understanding of and loss of interest in their own roles (Cernea et al., 1983). According to the researcher's experience, the most crucial problem hindering the T & V extension system in Burma was transportation. In the project area, it was not easy for extension workers to make regular visits to the farmers' field due to inadequate transport and communication such as telephone.

Contact farmers were an integral part of the T & V extension system. They were considered to be the most important persons in the village; whatever they said or did would have great impact on the villagers. They were responsible to transfer new and improved practical technology to their neighbors. The problem was the contact farmers' inadequate basic training and educational level. It will be a big mistake to expect too much from these contact farmers in the dissemination of technological information to neighboring farmers. The T & V system focused on field delivery and was generally weak in technological knowledge adoption. The educational level of the VEWs as well as contact farmers was very critical to transfer technical information to farmers. Frequently, farmers complained that the VEWs' recommendations to maximize outputs, although appropriate, often
required more labor than was usually available, and might involve costs that farmers were not willing to pay or able to bear.

Coordination with other organizations was another complicated problem in most lesser developed countries, especially in a bureaucratic country where the T & V system cannot operate very well.

Budgetary constraint was the greatest obstacle in carrying out extension service through the T & V system as it involved too much traveling allowances because the VEWs and supervisors had to visit regularly regardless of the effectiveness of the visit.
CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

This chapter analyzes the strengths and weaknesses of the Burmese extension system using criteria specified in Chapter 3. Based on these findings — in conjunction with an examination of three other extension models — it recommends measures that may help to improve the Burmese extension system.

Criterion 1. Linkage between extension and research

Chapter IV, the internal linkage between extension and research is moderately strong in the Burmese extension system, but international linkages are very weak. The present organization of the Burmese Agriculture Corporation — the agency responsible for extension work — needs modification in order to conduct effective educational programs to transmit knowledge to farmers. The majority of extension workers do reside in townships and villages. They are front-line extension workers who should have the technical skills to deal with farmers' daily problems. If extension personnel at the township and village level are to meet this objective, there must be a close working relationship between extension and research workers within the Agriculture Corporation, and research activities should be assisted by subject matter specialists from the agricultural colleges and the Institute of Agriculture so that agricultural research as a whole is integrated in an organizational framework.
The cooperative extension service of the U.S. (see Chapter IV) handles extension and research linkages via joint appointments. It assigns 20 percent of its technical extension staff to these linkage roles. Extension work in the U.S. is organized in each state by a Land-Grant University, thus ensuring effective linkages between extension and research in the entire nation. Each department in colleges of agriculture in these universities is responsible for research, teaching and extension activities. Many faculty members work in both research and extension roles. Organizing extension work within a university in this fashion reduces the political influence on the extension service, even though the university receives extension funding from federal, state and local governments.

The Training & Visit system of extension work (See Chapter IV) gives attention to extension and research linkages in theory but largely ignores this problem in practice. The FSR/E system (See Chapter IV) addresses this linkage problem through joint on-farm research and demonstration efforts aimed at developing site-specific technology for farmers. FSR uses an "on the ground" farmer/researcher partnership to identify problems and test farm-level technologies. FSR/E provides a more immediate and systematic way to give research assistance to small farmers in cooperation with extension workers.

No nation can achieve high levels of agricultural production without effective research and extension. Extension and research must work cooperatively and develop a strong link between their two
systems. Coordination and feedback between research and extension is related to basic physical and institutional infrastructures. If extension and research systems emphasize feedback from farmers, important implications for agricultural educational programs will emerge. Without feedback from farmers to researchers via extension workers, research programs will not be related to farmers' true problems. Therefore, it is recommended that Burma should establish one and only one research division under the Agriculture Corporation by combining the two existing research divisions (i.e. Agricultural Research Institute and Regional Research Division), and eliminating or minimizing the overlap and wasteful duplication of research efforts. Furthermore, the agriculture colleges and the Institute of Agriculture should be put under the auspices of the Ministry of Agriculture and Forests (instead of the Ministry of Education) to facilitate closer collaboration between agricultural research and extension.

Research and extension personnel should cooperatively plan and participate in more field trials and demonstrations. The research staff must receive continuous information about production problems confronted by farmers. Regional research-extension coordinating bodies headed by state/divisional level officers should be established, and research and extension personnel should meet together annually (at fixed dates) to discuss farmers' needs and develop crop production recommendations.
Agricultural researchers and policy-makers in Burma should become more aware of the role and importance of a strong national research network. Researchers should be encouraged to become involved with international research activities and to gain better access to research findings that can accelerate Burma's development and agricultural growth.

It is strongly recommended that the basic FSR/E approach be modified and used to strengthen extension-research linkages as well as technology development and transfer. The agricultural educational institutions should assume an important role in agricultural development. All agricultural extension workers and researchers in Burma are graduated from these institutions, which are organized on a British model, to the country's needs and conditions. The curriculum is too theoretical and teaching methods are too exam-oriented.

The Burmese government did formulate a new educational policy in line with its overall national socialist policy, and too little emphasis to the need for new agricultural technologies, new ways of rural living, and international standards of agricultural skills. An agricultural education department has not yet been established at the Institute of Agriculture, and there has been an overdependency on the lecture method of teaching.

In conclusion, there is an urgent need to link Burma's agricultural educational institutions with research stations and extension workers, so that courses and graduates in different
disciplines meet the needs of a national agricultural research, teaching, and production system.

The Institute of Agriculture should establish a Department of Agricultural Education when conditions are favorable and adequate facilities are available. Its curriculum should be revised to meet the country's needs. The Institute of Agriculture and junior colleges of agriculture should provide education not only technical subjects but also courses in management and social sciences. Instruction in these schools should be scientific and research-oriented with sufficient experience in on-farm practices to develop practically-oriented skills. The following topics are recommended for the curriculum of the Institute of Agriculture and the extension educational programs carried out by the Agriculture Corporation.

a. Program planning and development.

b. Evaluation of extension programs.

c. Administration and supervision of extension programs.

d. Extension methods for less developed countries.

e. Use of audio-visual materials in communication of agricultural concepts.

f. Diffusion of information and technology.

g. Teaching methods and techniques.

h. Education for rural development

i. Internship programs in extension service at the township level

j. Research methods and design.
It is also very important that agricultural educators -- both extension workers and university or college teachers -- understand the principles of learning and teaching. Course instructors should apply methods of teaching and appropriate to particular education situations. The general emphasis in agricultural education should be a problem-solving approach as exemplified by Newcomb et al. (1986), which would serve as an excellent handbook for teaching and learning principles in the Burmese situation.

The Institute of Agriculture is now the only agricultural educational institution at university level in Burma. Additional graduate training facilities and research in agricultural education and extension work should be established in cooperation with the Agriculture Corporation.

Criterion 2. Adequate Financial Resources

One important aspect of governmental participation in agricultural development and growth is a public investment program. Most developed countries such as Japan and the U.S. have extensive investment programs in agricultural research. For example, the Japanese government in 1985 proposed to spend $316 million on biotechnology research (USDA 1987). It is clear that investment in agricultural research produces technological improvements and dramatically higher crop yields. If adequate funds are not allocated to research, the scope of research will be reduced and consequently, the development of new technologies will be very slow. The World Bank (1981) suggests
that one to two percent of agricultural gross domestic product (AGDP) be invested in agricultural research in less developed countries to ensure an adequate flow of technology. According to Manniche (1978), one percent of national income should be allocated to the extension service in developing countries, and no other investment is likely to generate bigger returns in the immediate future and in national economies that depend on agriculture.

The Burmese agricultural extension system, however, has not had financial support consistent with the primary role of agriculture in the country's economy. Both the agricultural and industrial sectors in Burma have developed very slowly. Growth in GDP, less than 3 percent in 1962 to 1972, did rise to almost 7 percent by 1980 after the Burmese government gave greater priority to investment in the agricultural sector. However, Burma still remains one of the poorest nations in the world in terms of per capita GDP (U.S. $180 in 1981 compared to U.S. $670 in neighboring Thailand).

Another potential source of funds for agricultural development is the involvement of the private sector in agriculture. Incentives for the private sector to become involved in agricultural research and extension educational activities can lead to improved farm productivity. Commercial companies such as fertilizer, pesticide and seed suppliers in the U.S. have invested in the development of new varieties, new pest control methods and improved agronomic practices for important crops. In such instances, the private sector indirectly
assists the extension system in terms of financial and technological support. However, there have been no private firms of any kind in Burma since 1962; a possible alternative is to seek the aid of private companies outside the country. It is recommended that:

1. Burma, being an agricultural country, should make greater investments in its agricultural sector rather than other sectors.

2. Adequate financial support for agricultural research and extension should be paramount in national investment planning.

3. Private sector involvement in the Burma's agricultural sector should be encouraged.

4. Help should be sought from donor agencies to develop Burmese agriculture and improve rural life.

Criterion 3. Adequate Human Resources

Well trained persons are essential for agricultural development in any country. An effective research or extension programs cannot be designed or implemented without adequate human resources. Burma has a short supply of subject matter specialists in most fields of agricultural science. More agricultural technicians are needed in Burma. The front-line workers of the Burmese extension system are village managers with a low educational level, usually a seventh grade education plus ten months of preservice training. These training efforts concentrate on theory and provide little opportunity to apply
educational techniques as a learning device. Little attention is given to continuing in-service training for village managers; their educations are thus apt to be out of date and their major task — stimulating farmers to learn — is hampered accordingly. Village managers need a much better orientation toward farmers' problems so that they will become more effective in helping farmers by understanding the practical as well as the theoretical background to their work.

Burma has too few resource persons in either research or extension to make a major impact on agricultural production problems. The number of subject matter specialists is less than one percent of the total of extension workers in the Burmese extension service. Therefore it can be assumed that the capacity of the Burmese extension system to provide technical backstopping and training for field personnel is very weak. Without more trained personnel over the next five to ten years, the Agriculture Corporation will not be able to cope with Burma's agricultural production needs. Therefore, the following recommendations are made:

1. Burma needs to place more emphasis on manpower development programs.

2. It needs to train many persons in different fields of agriculture, both in-country and abroad. Many scholars should be sent abroad for both short and long term training.

3. Well trained researchers and extension personnel should be properly assigned to appropriate jobs.
4. Staff must not only be properly trained, but must also be motivated to do their part to increase crop production. Staff should know their responsibilities (job descriptions) and be held accountable for them.

5. Supervisors and administrators should establish procedures for monitoring and evaluation, and regularly evaluate the performance of each staff member.

6. Regular training sessions (particularly for village managers) should be conducted to improve knowledge of production technology, communication skills and leadership abilities.

Criterion 4. Program Development Procedure

An effective extension system such as the cooperative extension service of the U.S. has a proper program development procedure. The Burmese extension system does not.

According to Leagan (1974), the effectiveness of educational programs cannot be achieved through trial and error, but only through design. The fundamental philosophy of the cooperative extension system in the U.S. is that active participation by farm people in program development is essential to the effective planning of educational programs. The U.S. system recognizes four groups of people who are associated with program planning: 1) the community or society at large; 2) the clientele; 3) the extension organization; and 4) the agent. The role of agents in this scheme is to establish a
relationship, help with the identification of needs, help to set priorities, help in deciding the best course of action and help in evaluating the impact of the program. In all this, the agent functions as an analyst, catalyst, stimulator or facilitator. Rural people are involved in every aspect of the program. Figure 8 (see next page) gives an idea of how planned development is emphasized by the cooperative extension system in the U.S. Under this program development approach, the U.S. extension service has achieved a good record by constantly providing the people with educational opportunities which contribute to resolving problems pertinent to their economic and social well being.

When rural people are involved in program development, extension agents are able to learn how their clientele perceives the quality, suitability, efficiency, effectiveness and importance. In Burma, however, most development programs are planned from above in a "top down" approach. In this approach, programs may or may not be compatible with the values, beliefs and aspirations of the clientele.

Most extension programs in Burma are related to national crop production goals, but these goals should nevertheless coincide with those of farmers. For example, the government goal to increase food production coincides with that of farmers who can raise their incomes by increasing their crop yields. Sometimes Burmese farmers are forced to grow certain crops in line with production targets for these crops set by the government, but farmers may not perceive this to be in their own best interests.
Figure 8 - Six Interrelated Processes of Program Development
(Source: Lawrence, R. L. 1974)
In this circumstance, extension workers or local party leaders must influence farmers to grow the "required" crops and they may well lose the trust of farmers. Thereafter, agricultural extension workers may be unable to convince farmers that other non-political recommendations and practices are in the farmers' best interests. The following recommendations are made:

1. Top level management persons and planners in Burma should become acquainted with program development procedures and concepts.

2. Program development procedures in the Burmese extension system and agricultural planning system should be established and should include the following steps:
   a. Analyze situations
   b. Identify needs and interests of people
   c. Determine objectives
   d. Develop plan of work to achieve objectives
   e. Execute the plan of work
   f. Review results in terms of objectives
   g. Go back and repeat the process

3. Because the Burmese economy depends mainly on agriculture, its agricultural extension system should have a strategic plan for program efforts. McConkey (1981) outlines a model for strategic planning and program decisions based on organizational strengths as follows (Figure 9):
McConkey suggests that organizations should look at both their organizational strengths and the environmental demands for their programming. He suggests that organizations such as extension focus energies on "star" programs, and eliminate or downplay their involvement in other less successful programs.

Criterion 5. Extension Delivery Methods

Extension education has become the largest problem solving educational system in the U.S. under its cooperative extension service. The agricultural technology delivery system of the U.S. extension service is effective because it has a good linkage with
government-sponsored agricultural research as well as private research organizations. It recognizes that commercial companies play an important role in extension work with farmers. Commercial media such as farm journals and computerized data banks also have a significant part in technology transfer for agricultural development in the U.S.

A variety of extension teaching methods, ranging from home visits to satellite programs, are used by county agents. Tours and field days still continue to be important extension in the U.S. and in Burma. Conducting "method" and "result" demonstrations is one of the most effective extension tools available. Demonstrations can stimulate farmers to try out innovations themselves, and may bypass the need for a small-scale "test" of the innovation by farmers.

The U.S. extension service uses several mass media methods to reach a large clientele, while the Burmese extension service must mainly rely on contact methods other than the mass media. Despite this constraint, it must be recognized that program delivery methods are very important to transfer technology or transmit technical information to farmers. The principal way to improve farm efficiency and increase agricultural production is to educate farmers; the aim of any extension system is to bring about changes in knowledge, attitudes, and skills through education. In other words, an extension service should educate people to solve their own problems. County agents and other extension educators in the U.S. extension service are highly skilled in diverse teaching methods compared to Burmese
extension workers. U.S. extension agents usually apply a teaching method that: 1) develops an awareness of new technology or innovation; 2) creates an interest in it; 3) evaluates the advantages and disadvantages of using it; 4) conducts a trial to test the innovation on a small scale; and 5) assists in adoption to apply the innovation on a large scale.

One of the major constraints of the Burmese extension and research system is that its capacity for producing and using mass media teaching materials is very low. Moreover, the potential content of such materials is weak because of a lack of technology development (or adaptation by researchers in Burma. Insufficient development of improved technology results in a lack of valid recommendations for crop production. Under such conditions, the extension system does not have the strong research base it needs to produce the required range of technical options for a large and diverse small farm population. Most staff members at regional research stations are concentrate on seed multiplication programs rather than new and more efficient methods in crop production. They do not focus on solving the technical problems limiting productivity of the Burmese crops. At present, Burmese researchers are not able to publish their research findings as annual production guides or extension bulletins, etc., so the results of research do not go into practical application quickly enough.
The following recommendations are made for further improvement of the Burmese extension system.

1. The Burmese extension system should use more mass media methods—leaflets, radio broadcasts and extension publications.

2. Scientific publications should be allowed to circulate freely.

3. Demonstration plots should be conducted on farmers' fields as a key extension activity.

4. Extension workers, being educators, should greatly improve their knowledge of diverse teaching methods.

5. Extension workers should understand the concepts of the innovation- and adoption process include the characteristics of innovations related to the rate of adoption.

6. A higher priority should be given to applied research to utilize limited resources more effectively.

7. Scientific knowledge and principles should be adaptable to the Burmese environment.

8. Research should focus on low-input technologies such technologies should also be imported and adapted at an accelerated pace in order to raise production levels.

9. Seed Multiplication and distribution should be done by private enterprise instead of research farms of the Agriculture Corporation. Only foundation seed production should be under the direct management of the seed farm to insure that quality standards are met.
Criterion 6. Time Allocation to Educational Duties

Extension workers of the three major extension models analyzed in Chapter IV spend much of their time on educational activities; but extension workers of the Burmese extension system have multiple tasks. They are responsible for data collection, debt collection, general reporting, and distribution of agrochemicals and quality seeds in addition to giving technical advice. It is obvious that Burmese extension workers, up to the level of township managers are spending too much time on non-educational activities that reduce the effectiveness of the Burmese extension system. Therefore it is recommended that:

1. The Agriculture Corporation should not undertake importation and distribution of fertilizers and pesticides.
2. The Procurement and Distribution Division of the Agriculture Corporation should be abolished and the staff should concentrate on farm educational activities.
3. The private sector should undertake distribution of agricultural inputs.

Criterion 7. Technology Utilization

All agricultural extension systems attempt to educate farmers so that they change their behavior and adopt new technology. However, the use of new technology is also influenced by other factors. Although there are many potential indicators for assessing technology use by farmers, this study addresses only pricing policy, the
availability of agricultural credit, access to physical inputs (particularly chemical fertilizers), and production itself. On the basis of findings about these indicators in Chapter IV, the following recommendations are made to improve the Burmese agricultural extension system:

1. The Burmese government should give first priority to the agricultural sector for economic development of the country or political decisions are required for agricultural development to occur. The government should lay down agricultural policies that aim to improve the country's economic condition. Costs and incomes of farmers can be influenced directly, by price stabilization and marketing schemes, income tax allowances, and subsidies for freight and fertilizers.

2. In Burma, there is an urgent need to improve the marketing and distribution system. The price of agricultural commodities should not be fixed at the same level for years. It should instead be based on costs of production, world markets, interests of farmers and consumers, and national needs, etc. The price should be changed depending on situation. For example, if the government wants to increase production of exportable crops, the prices paid for these crops must be set to ensure that it is more profitable for the Burmese small farmers to grow these crops. Increased agricultural production using new technology requires price incentives sufficiently attractive to motivate the farmers.
3. Increased agricultural production also requires inputs such as seeds, fertilizers, pesticides, and agricultural credits. Fertilizer availability should not continue to be a major constraint on agricultural production in Burma. Fertilizers should be available in a timely fashion as farmers required. Disbursement can be accomplished through private enterprise.

4. The average yield per acre of major crops in Burma is very low. The only way in which a major and immediate increase in production can be accomplished is by the introduction of improved methods of production on the holdings of rural small farmers. This job can be done by an effective and efficient extension system in cooperation with research efforts.

Criterion 8. Monitoring and Evaluation

Properly designed systems to monitor and evaluate agricultural extension and research programs exist, for example, in the cooperative extension system in the United States. The T & V system is also organized in a way that ensures close supervision of field staff by monitoring and evaluation units. It is very important for extension workers to report the farmers' real situation to policy-makers and researchers; but top-managers in some countries not excepting Burma, dislike negative information and reports. To ignore negative information, however, is a mistake that prevents a country from progress.
In the Burmese extension system, the field extension workers (particularly village managers) are dispersed throughout the whole country. They have little contact with their superior officers, and it is difficult to check whether or not they are performing their duties expected of them. At present, there is no system to monitor and evaluate extension and research programs in Burma. Recommendations are as follows:

1. Goals, objectives, and policies of research and extension system should be clearly defined and job descriptions for research and extension personnel should be clearly stated.

2. Policy-makers or authorities should encourage subordinates to report real situation, failures as well as accomplishments.

3. A suitable system should be designed to ensure that the extension organization is operating effectively and efficiently, to enable management to take corrective action when necessary, and to provide policy-makers with correct information.

Specific Recommendations

Based upon the analysis of three extension models as well as the Burmese system, this study concludes that agricultural extension systems are interdependent with the agricultural development process. An extension system requires linkages with other factors to function
successfully. These factors, on the basis of criteria used in this study, include:

1. Research
2. Government agricultural policy and support such as funding, pricing policy, marketing systems, and availability of agricultural inputs
3. Human resources
4. Agricultural program development procedures
5. Program delivery methods
6. Time allocation for educational activities
7. Technology development and utilization
8. Monitoring and evaluation systems

The Burmese extension system has evolved from a colonial system to an existing system embodied in the Agriculture Corporation. The specific strengths of the Burmese extension system are: 1) the existence of research divisions under the same organization; 2) a relatively large number of village managers assigned at the village level as front-line extension workers; and 3) job security for extension staff. However, it can be concluded that the overall the Burmese extension system is very weak in other areas, as follows:

1. Two research divisions are working separately for the same goal under the same organization without close coordination and cooperation with each other, or with extension. The Agriculture corporation has not established proper procedure for monitoring and evaluating research activities.
2. There is no involvement of private enterprise in the agricultural sector.

3. Government pricing policy, and marketing and distribution systems do not encourage small farmers to increase crop production.

4. The Burmese extension system lacks trained manpower. It has an extremely low number of subject matter specialists, and this is the weakest link in the whole extension system. A systematic human resource development program has not been developed. The biggest problem lies with the low qualifications of village managers in Burma. The lack of technical support for them has also been a major obstacle to effective agricultural extension work in the country.

5. Policies on agricultural extension work plans and programs are normally decided and designed by high ranking personnel, at ministerial and departmental levels. The disadvantage of this top-down strategy is the misunderstanding of local conditions and therefore, the inappropriate use of available resources. Programs sometimes fail to deal with the true needs and problems of farmers. Various agricultural development projects have, in general, had not involvement by rural people in the design or objectives of the projects. Village managers have carried out their roles without any written planned program; extension programs are neither planned systematically according to program development procedures nor supervised adequately.
6. The Burmese extension system is very weak in program delivery methods. It is important for extension program planners to design and implement appropriate educational programs and plans of work, especially in terms of teaching techniques, but extension educators in Burma are deficient in knowledge of adult education methods. The use of mass media is very limited and production of mass media materials is very negligible in relation to the size of the population. Both the Agricultural Research Institute and The Agricultural Research Farms have yet to produce a comprehensive report of their scientific activities in the form of a publication or extension guide. Most research farm managers do not even recognize the need to be accountable for their results or to be responsible for transmitting the results to farmers. The mechanisms for communication of research results to farmers are thus extremely weak.

7. Extension workers in Burma spend too little of their time on agricultural extension activities because they are multipurpose workers with many non-educational duties.

8. The Burmese extension system has not established a suitable procedure for personnel management or for monitoring and evaluating agricultural programs. Township managers and village extension managers generally do not have a detailed
schedule of work. The lack of capable staff remains a basic obstacle to establish the monitoring and evaluation function in Burma. There are no defined channels for reporting research results or getting feedback on the usefulness of research.

Conclusions

There has been an inadequate growth of agricultural production as well as a too-limited improvement in the standard of living of the rural population in Burma. Because the Burmese economy depends on the productivity of the agricultural sector, agriculture must become more productive to attain economic growth and to achieve higher living standards. Increased agricultural production can be achieved, in part, by improving the existing agricultural extension system. To improve the existing system the following recommendations are made:

1. The two existing research divisions, the Agricultural Research Institute and the Regional Research Division, should be combined into one division that will reduce unnecessary duplication of functions, reduce the time-lag between the creation of a new practice or technology and its widespread application by farmers and maximize utilization of limited research and extension resources. Also, research and extension personnel should cooperatively plan and implement agricultural research and extension programs.
2. Private enterprise should be allowed to become involved in the agricultural sector.

3. The government should give first priority to the agricultural sector, and its marketing and distribution systems should be improved in consultation with economists. The government should employ economic incentives (including price policies) to bring about harmony and fairness between production costs and the selling price of crops. The government should permit private individuals to buy and use agricultural machinery including tractors for reclaiming more fallow land and extending multicropping.

4. Manpower planning and development programs should be undertaken as soon and as fully as possible to enlarge the number of trained persons. Regular reinforcement of knowledge and information for village managers should be given through a systematic training program so that village managers can provide farmers with profitable technology. Village managers should possess relevant skills, be able to perceive farmers problems, and offer useful advise, develop good relations with farmers, and communicate effectively by taking regular training courses.

5. Agricultural extension programs should be encouraged to deal with the true needs and problems of farmers by giving more attention to the program development process.
6. The extension service should be provided with facilities that allow greater and more effective use of mass media methods to reach a larger clientele and to produce scientific publications and extension bulletins. Demonstrations on farmers' fields should be used as a key extension activity. Extension workers should learn more effective teaching principles. (Figure 10).

7. The extension system in Burma should no longer be required to distribute fertilizers, pesticides and seeds. The only responsibility of extension workers should be to transfer agricultural technological knowledge from researchers to farmers, and to communicate the farmers' problems to the researchers.

8. The Agricultural Project Planning and Evaluation Division of the Agriculture Corporation should be strengthened in order to make plans, coordinate, monitor and evaluate all agricultural extension and research activities in the country. Major training efforts are needed for staff to become effective at these responsibilities.
Figure 10. Concepts of Adult Training
(From: Sangsingkeo 1989)
9. The main objective of the agricultural extension system in Burma is to increase crop yields by encouraging the adoption of modern agricultural technologies, developed by researchers to solve farmers problems. Burma should concentrate its own research efforts on applied research needs. "Basic" research demands more technical, human and financial input than the country is able to afford at present, but Burma can benefit from basic research conducted by international agricultural research organizations, if there is a link with these institutions. It is necessary to establish that link. It is also necessary to improve the quality of agricultural education and research within the country. No agricultural extension system is perfect. No single organizational model can be recommended as the most effective way to organize a national research and extension system. A system must be developed or modified to fit an individual country and changing situations. (See Figure 11)
Figure 11. System of Agricultural Technology Development and Transfer in Burma (Proposed)
In Burma, communication among researchers and extension workers and farmers must be increased. There should be a strong link between research and extension to develop new technology and transfer it to farmers. Agricultural educational institutions should be under the Ministry of Agriculture and Forests, if possible, to strengthen the research capacity and their linkage with research and extension. As it is obviously impossible to make such a change quickly, it is advisable to facilitate a better coordination and cooperation among them for technology development and application. The following steps and strategies are involved in modifying and improving the present system.

1. Study the needs of the country.
2. Analyze farmers' situation.
3. Identify production constraints.
4. Involve people. Adoption of improved technology by farmers requires active involvement in the research and extension program development process by all three parties concerned: researchers, extension workers and farmers. In general, there is a communication gap between researchers and farmers in Burma.
5. Set priorities for research programs in accordance with limited resources, state policies, and the clientele's needs.
6. Develop new technology, and interpret research results in such a way that they help solve particular farm problems.

7. Conduct problem-oriented research, and use the knowledge and experience derived from innovative farmers.

8. Recognize that research on adapting new technologies should be conducted in farmers' fields.

9. Formulate research efforts, when needed, to examine agroecological differences in the country, there can be some specific or localized agricultural problems faced by extension workers.

10. Test all research findings in trials on farmers' fields before they are recommended to farmers. A large number of local trials should be carried out to modify and adapt innovations to variations in climate, soil and culture. Research and extension workers should cooperate in the on-farm verification trials.

11. Stimulate feedback to researchers from farmers and extension workers. Agricultural performance is evaluated and reports were submitted to the appropriate persons. Regular feedback to researchers is essential to future research programs.

Areas for Future Research. The recommendations presented here are part of a general strategy for improving the Burmese agricultural
extension system in the near future. There is no ideal agricultural extension system that suits all countries because there is great variation in economic, social, cultural, political, physiological and infrastructural factors. It is not easy to apply extension methods used elsewhere in the world to a less developed country. Research programs similar to this study should be carried out by international students to develop a better framework for modifying existing extension models to fit a specific country and its different conditions.

There are many such research areas in Burma, including administration; crop production; communication and educational delivery methods; personnel and staff development; monitoring and evaluation; international extension activities and youth development. Among these areas, it is recommended that priority be given to the following:

1. Personnel and staff development: Special attention should be given to the training needs of agricultural extension workers.

2. Crop production: research should place more emphasis on:
   a) relationship of characteristics of farmers and their adoption of improved farm practices; b) attitude of the Burmese farmers toward extension workers and new technology and c) sociological aspects of the knowledge-transfer process, etc.
3. Communication and educational delivery methods; for example, the impacts of different mass media group and one-on-one methods, specific to radio programs and extension pamphlets.

4. Monitoring and Evaluation: national and/or regional studies should be planned and conducted cooperatively by national staffs and outside consultants from abroad. Specific procedures should be adopted for appraisal of the extension system through impact studies.
APPENDIX A

MAP OF BURMA
APPENDIX B

JOB DESCRIPTIONS OF SOME STAFF MEMBERS OF OHIO
Director of Extension

1. Is responsible for determination of overall policies, objectives, and programs in keeping with the framework as established by federal and state laws; the Memorandum of Understanding between The Ohio State University and the United States Department of Agriculture concerning administration; policies of The Ohio State University and the Colleges of Agriculture, Home Economics, Biological Sciences and Veterinary Medicine; and the stated objectives of the Ohio Cooperative Extension Service.

2. Is responsible for formulation of guidelines for the educational program of the Ohio Cooperative Extension Service and its administration, including delegation of authority and assignment of duties to state and field faculty covering all aspects of planning, financing, staffing, coordinating, reporting, and evaluating relative to the operation of all programs and activities participated in or conducted by the Ohio Cooperative Extension Service.

3. Is responsible for maintaining effective working relationships with all individuals, groups, organizations, and agencies which are part of or which are directly related to the Ohio Cooperative Extension Service.

4. Is responsible for development of both request and operating budgets, the securement of the budget, and the financial integrity and accountability incident to the conduct of the Ohio Cooperative Extension Service.

5. Is responsible for recruitment, employment, and development of highly competent administrative, supervisory, management, and faculty staffs whose duties will include:

   a. The provision of adequate pre-service, in-service, and graduate education for all categories of faculty employed by the Ohio Cooperative Extension Service.

   b. Development of effective personnel management procedures, including faculty evaluation, records, and the maintenance of an organizational chart and job descriptions which delineate clearly the duties and functions of all faculty.

   c. Maintenance of adequate faculty to discharge program obligations and provision of the necessary and appropriate supplies, equipment, and other operating essentials needed to conduct an effective educational program throughout Ohio.

   d. Establishment of procedures essential for recruiting and selecting faculty.

   e. Maintenance of an effective information program involving the most modern and efficient means of communication so as to adequately discharge Extension's responsibilities to its participating clientele and to the general public.
f. Planning for and initiation of new projects and programs as warranted by present or impending changes in agriculture, community and natural resource development, home economics, or youth work in keeping with changes in the general economy which affect them.

6. Is responsible for promulgation of a clear understanding relative to the objectives, responsibilities, and scope of the Ohio Cooperative Extension Service as well as the duties to be performed by every faculty member of the organization.

7. Performs such other duties as are assigned or as judgment or necessity may dictate.

8. Reports to the vice president for agricultural administration.

9. Upholds the policy that educational programs and activities conducted by the Ohio Cooperative Extension Service are available to all potential clientele on a non-discriminatory basis without regard to race, color, creed, religion, sexual orientation, national origin, age, handicap or Vietnam-era veteran status.
District Supervisor

1. Is responsible to the director of Extension for the coordination and supervision of all Extension operations within the assigned Extension district. This includes all administrative and other matters affecting programs, personnel, finance, relationships, and business operations.

2. Serves as the immediate supervisor and directs the work of district faculty and county chairpersons employed in the counties in the district.

3. Supervises the development, preparation, and conduct of Extension programs, plans of work, and reports of results for the district.

4. Stimulates standards of excellence and upgrading of faculty competencies in technical subject matter, communications, and program development.

5. Assists county Extension agent, chairpersons with the establishment and effective use of broadly representative county Extension advisory and support committees. Assists all district and county Extension faculty with the formation and effective use of needed program committees.

6. Counsels with district specialists and county chairpersons in the district regarding personnel selection and placement, salaries, promotions, tenure, performance appraisal, leaves of absence, vacations, and other matters of personal and professional concern.

7. Informs district and county Extension faculty of administrative decisions and policies pertinent to their functions and responsibilities.

8. Reviews and approves expense reports, calendar of work plans, and statistical and narrative reports for district specialists and county chairpersons.

9. Directs the preparation of district and county budget requests.

10. Develops and maintains effective relationships with agencies, groups, and individuals throughout the district.

11. Performs such other duties as are assigned or as judgment or necessity may dictate.

12. Serves as a member of the administrative cabinet of the Ohio Cooperative Extension Service.
County Extension Agent

County Extension agents may be assigned responsibility in one or more of the following program areas: agricultural industry; home economics and family living; 4-H youth development; and community and natural resource development. Special assignments within these program areas may be designated as determined by the district supervisor and county chairperson.

1. Is responsible to the county chairperson for personal and professional matters, including promotion, tenure, performance appraisal, leave of absence, vacation, and similar items. The district supervisor will consult with county chairperson prior to making recommendations relative to salary. Agent requests for absences from regular duty, including leave of absence and vacation, must be submitted to the district supervisor through the county chairperson. The chairperson will recommend approval or disapproval to the district supervisor.

2. Is responsible to the county chairperson for the conduct of the county Extension educational program in the assigned program area(s).

3. Maintains close cooperation with the county chairperson and with the county, district, and state Extension faculty to develop and conduct a well-balanced county Extension educational program.

4. Serves as a source of subject matter information and conducts an effective county Extension educational program in the designated program area(s) in consultation with program committees, county chairperson, district specialists, subject matter specialists, and Extension administrators.

5. Develops and involves effective committees in program development, training of leaders to assist in planning and conducting programs in designated program areas.

6. Prepares and submits to the county chairperson various reports, including:
   a. Monthly expense accounts and activity reports;
   b. Plan of Work, Report of Results, and Affirmative Action Reports;
   c. Appropriate sections of the county Popular Report;
   d. Other required reports, such as 4-H 237, EFNEP.

8. Plans for and uses appropriate teaching methods in conducting the Extension educational program. Evaluates teaching efforts and results in those phases of the program for which responsibility is assigned.

9. Cooperates with the county chairperson, other faculty, and staff to maintain effective working relationships with organizations and groups in the county.

10. Assists with the orientation and training of newly employed Extension faculty and staff as delegated by the county chairperson.
11. Supervises the work of non-faculty personnel as assigned by the county chairperson.

12. Performs such other duties as are assigned or as judgment or necessity may dictate.

13. Upholds the policy that educational programs and activities conducted by the Ohio Cooperative Extension Service are available to all potential clientele on a non-discriminatory basis without regard to race, color, creed, religion, sexual orientation, national origin, sex, age, handicap or Vietnam-era veteran status.
LIST OF REFERENCES


Chang, C. W. (1962). Increasing Food Production Through Education, Research, and Extension; Freedom From Hunger Campaign Basic Study #9, FAO.


