PERCEPTIONS OF THE ROLE OF THE AGRICULTURAL EQUIPMENT INDUSTRY IN THE AGRICULTURAL MECHANIZATION EDUCATION OF DEVELOPING COUNTRIES

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ABSTRACT

PERCEPTIONS OF THE ROLE OF THE AGRICULTURAL EQUIPMENT INDUSTRY IN THE AGRICULTURAL MECHANIZATION EDUCATION OF DEVELOPING COUNTRIES

By

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Purpose

The primary purpose of this study was to assist in improving the efficiency of agricultural mechanization education in developing countries by delineating the appropriate educational role of the agricultural equipment industry in developing countries, as perceived by individuals with international agricultural mechanization experience.

Procedure

A survey instrument was developed through review of literature and the assistance of representatives of the agricultural equipment industry and university personnel who were experienced in agricultural mechanization in developing countries. This instrument contained fifty items which were sub-divided into clusters pertaining to the agricultural equipment industry assisting in agricultural mechanization education within the context of

the educational systems of these countries, assisting outside the educational system of these countries, assistance in the form of instructional aids, workshops and seminars, and scholarships and grants.

The instrument was answered by eighty-six individuals who had agricultural mechanization experience in a total of thirty-three developing countries. The respondents were asked to indicate their perceptions to the appropriateness of the agricultural equipment industry's involvement in the activities by rating the items on a five point scale of appropriateness.

To identify differences in responses that might be due to various backgrounds of the respondents, they were divided into sub-groups by nationality and occupation. To identify differences in responses that might be due to location or levels of development of the countries represented, the countries were divided into sub-groups by geographical location, levels of economic development, and levels of educational development.

The frequency of the responses were tabulated and the results were analyzed by the use of the one-way analysis of variance test to identify significant differences in responses.

Findings

Based on the perceptions of the respondents, the agricultural equipment industry should direct its

assistance towards the secondary, post-secondary, and university levels of education but not towards the elementary level. This assistance should be in the form of instructional aids directed towards the area of engine powered agricultural mechanization. The respondents did not perceive it appropriate for the agricultural equipment industry to assist in animal powered agricultural mechanization education or become involved in literacy education. Assistance in the training of mechanics and in-service education of government personnel working in agricultural mechanization also appeared appropriate for the agricultural equipment industry.

There was a high level of agreement among the subgroups when the respondents were divided by nationality and occupation. When the countries were divided into subgroups by geographical location, levels of economic development and levels of educational development, there were significant differences in few of the responses. This indicated that educational assistance programs of the agricultural equipment industry, as perceived by the respondents, can be very universal in nature. The language may need to be translated and different specialized machines covered to fit the crops of a particular country but it does not appear necessary to emphasize financial aids in one area of the world, instructional aids in another, and the development of a program of workshops and seminars in a third part of the world. Instructional

aids ranked high in the study and, if series of these were developed by the industry, they could be utilized in many parts of the world with limited modification.

Conducting workshops and seminars for agricultural mechanization teachers was perceived appropriate by the respondents and could serve as a diffusion channel for any instructional aids that the agricultural equipment industry might develop.

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CHAPTER I

INTRODUCTION TO THE STUDY

The Problem

The primary concern of this study was to identify the appropriate educational role of the agricultural equipment industry in the agricultural mechanization of developing countries as perceived by individuals who have had agricultural mechanization experience in these countries. It was hoped that by identifying this perceived role it would be possible for representatives of the agricultural equipment industry and agricultural mechanization educators, of developing and more developed countries, to better coordinate their efforts and thus improve the efficiency of agricultural mechanization education in developing countries.

Background

Characteristics of Developing Countries

Between one-half and two-thirds of the world's population lives in what are commonly called developing or under-developed countries. The people of these developing countries are provided with material

advantages that are markedly inferior to those of the more developed areas. Although the people living in developing countries represent many different levels of advancement, they tend to have many characteristics in common.

The life expectancy of the people of the developing countries is about one-half that of individuals from more developed countries. Whereas the United States life expectancy is approximately seventy years, many of the developing countries have a life expectancy of less than forty years for their people.[1] These people suffer from malaria, dysentery, tuberculosis, and many other diseases. The future does not appear bright for them either as medical attention is a very scarce commodity in the developing countries. Whereas Japan has 900 inhabitants per physician, India has 5,800, Pakistan has 11,000, Nigeria has 27,000, Indonesia has 41,000, and Ethipoia has 96,000 inhabitants per physician.[2]

The average annual income for a person from a developing country is less than one-tenth that of an individual from the United States. In 1967, the average

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[1]Everett M. Rogers, Social Change in Rural Society (New York: Appleton-Century-Crofts, Inc., 1960), p. 441.

[2]William Paddock and Paul Paddock, Famine--1975 (Boston: Little, Brown, and Co., 1967), p. 31.

annual United States income was $3,303 while that of the individual from developing countries was approximately $300 with many of the countries having annual incomes of less than $100 per capita.[3] While the developing countries are able to increase this annual income slowly, the net increase is normally much greater in the developed countries, thus the spread between the two groups becomes greater.

The people of the developing countries tend to be much more rural than the people of the United States. Whereas only 8 to 12 per cent of the people of the United States are engaged in production agriculture, approximately 80 per cent of the people of the developing countries are engaged in production agriculture. In 1950, 88 per cent of the population of Thailand and 82 per cent of the population of Turkey were engaged in production agriculture.[4]

The developing countries tend to have a higher population growth rate than the more developed countries. Population growth estimates for the ten-year period of 1960 to 1970 show an 11 per cent population growth for the more developed regions which include Europe, USSR, North America, Japan, Temperate South America, Australia,

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[3]United Nations, 1968 Statistical Yearbook (New York: Publishing Service of United Nations, 1969), pp. 585-589.

[4]Rogers, op. cit., p. 443.

and New Zealand, while the balance of the world shows an increase of 24 per cent.[5] Individual developing countries' expected annual growth rates during this same ten-year period are as follows: Philippines, 4 per cent; Nigeria, 3.5 per cent; Thailand, 3.7 per cent; Pakistan, 3.4 per cent; and India, 2.5 per cent. The more developed countries show a much lower figure: Japan, 0.9 per cent; France, 0.8 per cent; United Kingdom, 0.5 per cent.[6]

The nutritional level of the people of the developing countries is considerably below that of the developed countries. Their daily calorie intake is about one-third less than that of the developed countries and tends to come from starch foods such as grains. Their consumption of meats, protein foods, minerals, and vitamins tends to be considerably less than that of the developed countries.[7]

Increased Demands for Food

The growing population of these developing countries will increase the demand for food considerably, but in addition, if there is an increase in the average annual income of the people of these developing countries, there will be an increased demand *per capita* for food. This

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[5] United Nations, *World Population Prospects as Assessed in 1963* (New York: United Nations, 1966), p. 23.

[6] *Ibid.*, pp. 145-149.

[7] Rogers, *op. cit.*, p. 442.

per capita increase in demand for food is brought about through what is called income elasticity of food index and refers to the change in proportion of income spent on food as income changes. The elasticity index figure is arrived at through the following formula:

$$\frac{\text{Per cent change in amount spent on food}}{\text{Per cent change in income}} = \text{Food elasticity index}$$

The elasticity of food index for developing countries is approximately .7 while it is approximately .2 for the developed countries. This means that as income increases, a greater portion of that increase will be used for food consumption in a developing country than in a more developed country.[8]

By using this elasticity index in the following formula, we are able to arrive at a more realistic figure of increased demand for food in these developing countries.

$$d = p + gn$$

d = Increased demand for food

p = Population growth rate

g = Growth in per capita income

n = Income elasticity index for food

Example: A country with a population growth rate of 3 per cent, an increase of annual income of 4 per cent,

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[8]Robert D. Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Countries, Foreign Agricultural Economics Report No. 23 (Washington: United States Department of Agriculture, 1965), p. 4.

and a food elasticity index of .7 will have an increase in food demand of 5.9 per cent.

Meeting Increased Food Demands

Brown lists two principal ways of achieving this greater production: expanding the cultivated areas and increasing yields.[9] In many parts of the world, increased food production will have to come from land currently tilled as the majority of suitable land has been brought under cultivation and only marginal land is available for further development.

The mechanization of agriculture is one answer that may contribute to both the expansion of cultivated acres and increased yields. Through the use of animal or mechanical power, the farmer is able to multiply his efforts many-fold and, if land is available, increase the number of acres he is able to till and harvest. This situation existed in the United States when part of the High Plains area was considered too arid for crop production as the production per acre was small and a farmer could not work enough acres with animal power to support a family. Increased technology and improved mechanization have enabled the farmer to operate many more acres and much of this land is now economically cultivated.

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[9]Lester R. Brown, Man, Land and Food, Foreign Agricultural Economics Report No. 11 (Washington: United States Department of Agriculture, 1963), p. vi.

Even if there is not additional land available, it is possible to increase yields through mechanization by more timeliness of operations. Through mechanization, it is possible to meet more nearly the optimum dates of seeding, weeding, fertilizing, and harvesting of crops, thus increasing the yields per acre.

Educational Needs

One of the essential ingredients of development is the establishment of an educational system that more nearly allows the individual to develop his talents to the fullest. Without education, the country not only lacks competent professional and technical personnel of every sort but also the educated and responsible citizenry to provide the necessary framework upon which development can take place. Some countries are underdeveloped because fewer than 10 to 20 per cent of their population have been educated in such a way as to make proper use of their innate capacities.[10]

Curle points out that it is necessary to develop a "new class" or "middle class" in order to bring about change in the developing societies.[11] This "new class" is to fill the void that exists between the elite and

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[10]Adam Curle, Educational Strategy for Developing Societies (London: Travistock Publications, 1963), p. 3.

[11]Ibid., p. 56.

the peasants and are individuals who have broken away from the traditional structure sufficiently to assume a position in society that is determined by training or ability rather than birth. Education is a major force in the formation of this "new class."

Marshall reinforced the declared need for education in developing countries when he stated:

> There is no extravagance more prejudicial to the growth of national wealth than that wasteful negligence which allows genius that happens to be born of lowly parentage to expend itself in lowly work.[12]

In discussing definitions of under-development, Curle states: "If I were compelled to define under-development, I would do so in terms of failure to make adequate use of human resources."[13]

With education playing such an important role in the progress of the developing countries, it appears appropriate to study ways and means to facilitate the growth and expansion of educational services in these countries.

Financing Education

Financing the educational systems of developing countries is one of the crises facing the world today.

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[12]Alfred Marshall, Principles of Economics (8th ed.; London: Macmillan, 1952), p. 212.

[13]Curle, op. cit., p. 69.

Some countries, which formerly offered free primary education to all, have been forced to change this policy and either reduce available educational services or establish an enrollment fee due to the high cost of education. One reason for this is that in a developing country, what we might consider only a partially trained person may command a salary as a teacher far in excess of the national average income. In the United States, the average salary of the primary teacher is approximately one and a half times the per capita national income, but the average salary of the primary teachers in Nigeria is nearly seven times the per capita national income.[14] Prior to 1967, some parts of Nigeria were devoting more than 40 per cent of their total budget to education.[15] Some Latin American countries are currently spending 3 to 4 per cent of their total gross national product on education compared to 1 to 2 per cent ten to fifteen years ago.[16]

The United States government has initiated numerous programs to help these countries in their educational endeavors. One of the most extensive of these is the

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[14] Ibid., p. 85.

[15] J. O'Connell, "Education, Economics, and Politics," West African Journal of Education, (June, 1963), 64.

[16] Philip H. Coombs and Karl W. Bigelow, Education and Foreign Aid (Cambridge, Mass.: Harvard University Press, 1965), p. 59.

Agency for International Development, but even its rather large sums make a limited impact on the problem. Watson points this out by stating:

> . . . no matter how wise and energetic AID's personnel may be, there is still not enough money nor people to accomplish this vast task the United States has undertaken.
>
> To put this in perspective, our government is today putting over two billion dollars each year into the economies of 72 countries. Yet this considerable sum, divided among their populations, comes to but $1.44 per person. Even in Latin America, where the effort is most intensive, the amount is only $2.73 per person per year. Clearly there are limits to what we can hope to achieve.[17]

One area of possible financial assistance is the private sector of both the developing countries and the United States. Watson believes it is only through private sources that the additional resources, potentially adequate to meet the challenge, can be obtained.[18] In 1965, an advisory committee on foreign aid made the following recommendation to the United States government:

> . . . that AID survey the possibilities of more extensive use of facilities of American-owned subsidiaries and affiliates in the less developed countries for training purpose; and it undertake to provide financial support, using local currency as available, for such added training activities as these enterprises or other organizations might

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[17] Foreign Aid Through Private Initiative (Washington: Agency for International Development, 1963), p. ii.

[18] Ibid.

be willing to undertake with the use of these facilities.[19]

There are several reasons why private industry may be of greater assistance to these developing countries than governmental agencies.[20] First, private industry is generally more flexible and can respond with greater speed than governmental agencies. As changes take place within the developing country, the private sector tends to be able to shift emphasis to meet new needs faster than governmental programs as there is less bureaucracy and "red tape" in the private sector. Second, aid handled through non-governmental channels carries less political risk. When government-to-government aid is mishandled, as aid may be at times, the political repercussions may be great. Although mishandling of aid is to be avoided if possible, there are fewer international implications if this mishandling occurs within the private sector of the economy. The third advantage of the assistance of industry is that they are not subject to the annual appropriation process that governmental agencies are and therefore may be able to maintain a more uniform program over longer periods. This continuity is important in educational programs that span many years.

One area of education in which it may be very logical for private industry to make a major contribution

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[19] Ibid., p. 40.

[20] Ibid., pp. 4-5.

is agricultural mechanization education. As developing countries expand their agricultural production, greater use is being made of agricultural mechanization. However, as this may be new to the country, the educational system often includes little or no instruction in agricultural mechanics even though the economy of these countries may be based on agriculture. The addition of this instruction causes an increased strain on an already over-extended budget as agriculture mechanization is considerably more expensive than the more traditional educational programs these countries are familiar with. Special education needs to be made available to instructors, additional physical facilities may need to be constructed, and special tools and equipment may need to be purchased. These additional expenses may be beyond the financial capability of the developing country.

Need for the Study

Some of the agricultural equipment companies have become involved in international education by simply expanding the activities they conduct in the United States or other developed countries. Although some may believe this approach to be appropriate, no research was identified to support this procedure. With the large differences that exist between the United States and the developing countries in literacy level, level of educational development, and many other measurements, it

appears questionable that educational activities appropriate for the United States are the most appropriate ones for developing countries. Some companies direct most of their educational activities towards providing scholarships for university students from developing countries to study for B.S. degrees or advanced degrees in education, agricultural engineering, or agricultural mechanization within the United States. Other companies believe it is more appropriate to develop training centers within the developing country for "middle level" students such as mechanics or technicians. Some companies prefer to work within the framework of the educational systems of the developing countries while others prefer to work outside this framework. There appears to be a variety of approaches to agricultural mechanization education in developing countries.

Adams points out the desirability of diversity in international educational activities but emphasizes the need for research in the coordination of these activities.

> Just as we applaud diversity in other American educational activities, so do we welcome the differences in our international educational approach. They make for a broad range of activities which are a potential source of strength for the national effort.
>
> Diversity can result in confusion, however, unless there are connecting relationships which promote unity among the diverse elements. A general unity of effort in international educational activities is particularly important because of their increasingly vital role in the achievement of world peace and progress. It is timely to consider ways in which the cause of

> unity may be furthered in view of the dramatic expansion of programs in this field in recent years.[21]

In reviewing literature and visiting with several of the United States agricultural equipment manufacturers and the Farm and Industrial Equipment Institute, the author was able to identify only one in-depth study conducted by these agencies concerning the appropriateness of educational activities that might be conducted in developing countries. However, these representatives exhibited considerable interest in cooperating in such a study.

Based on this situation, this study was initiated to identify characteristics of agricultural mechanization educational activities appropriate for the agricultural equipment industry to conduct in developing countries.

Objectives of the Study

The primary objective of this study was to determine the appropriateness of the agricultural equipment industry performing selected educational activities in developing countries as perceived by individuals with international agricultural mechanization experience. The specific objectives were summarized as follows:

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[21]As quoted in Michael J. Flack, Sources of Information on International Educational Activities (Washington: American Council on Education, 1958), p. v.

1. To identify the levels, within the educational system, that appeared most appropriate for the agricultural equipment industry to assist in agricultural mechanization education in developing countries.
2. To determine the types of educational activities that were perceived most appropriate for the agricultural equipment industry to conduct in agricultural mechanization education in developing countries.
3. To determine if there was any significant difference in the types of educational activities that were perceived most appropriate for different groupings of developing countries according to geographical location, levels of economic development and levels of educational development.
4. To determine if there was any significant difference between the perceptions of representatives of industry and education concerning the appropriate educational role of the agricultural equipment industry in developing countries.
5. To determine if there was any significant difference between the perceptions of United States and non-United States respondents concerning the appropriate educational role of the agricultural equipment industry in developing countries.

Assumptions Underlying the Study

The basic assumptions for this study were as follows:

1. Agricultural mechanization education is needed in developing countries.
2. It is appropriate for the agricultural equipment industry to be involved in education in developing countries.
3. The agricultural equipment industry is willing to make a contribution in agricultural mechanization education in developing countries.
4. Industry and education leaders who have had experience in developing countries can effectively identify: (a) the appropriate level in the education system for industry to assist in education, (b) the appropriate type of educational activity for the agricultural equipment industry to conduct in these developing countries.

Hypotheses

The basic hypotheses for this study were as follows:

1. The perceptions of the respondents will indicate that it is more appropriate for the agricultural equipment industry to assist at the university and secondary level than at the elementary level when working within the context of the educational systems of the developing countries.

2. If the agricultural equipment industry is to assist in education outside the framework of the educational system of a developing country, the respondents will perceive it to be more appropriate for this assistance to be in the training of mechanics than village level literacy education.
3. The respondents will perceive it to be more appropriate for the agricultural equipment industry to assist in engine powered mechanization education than animal powered mechanization education.
4. The respondents will perceive it to be more appropriate for the agricultural equipment industry to provide software type educational aids, e.g., printed matter, charts, and films, than hardware type aids, e.g., projectors, tools, tractors and farm equipment.
5. It will be perceived by the respondents to be more appropriate for the agricultural equipment industry to conduct seminars and workshops for agricultural mechanization teachers than for agricultural mechanization students.
6. The respondents will perceive it to be more appropriate for the agricultural equipment industry to provide student scholarships to be

used inside the developing countries than outside these countries.

7. The perceptions of the respondents will indicate that it is more appropriate for the agricultural equipment industry to provide educational aids than financial assistance in the form of scholarships or grants, when assisting within the educational system.
8. The perceptions of the respondents will indicate that it is more appropriate for the agricultural equipment industry to provide scholarships or grants than conduct workshops and seminars, when assisting within the educational system.
9. If United States education personnel are to assist in developing countries, the perceptions of the respondents will indicate that these individuals should serve for more than six months in these positions.
10. There will be few significant differences in the perceptions of various sub-groups of respondents, e.g., United States, non-United States, education, and industry, as to the appropriateness of the agricultural equipment industries' participation in various educational levels and educational activities for agricultural mechanization education in developing countries.

11. There will be few significant differences in the perceptions of various sub-groups of countries, e.g., geographical location, economic development, and educational development, as to the appropriateness of the agricultural equipment industries' participation in various educational levels and educational activities for agricultural mechanization education in developing countries.

Definition of Terms

Most of the words and concepts used in this research are familiar and are used in the conventional manner. The following terms are clarified to delimit the intended understanding.

Agricultural Equipment Industry.--That industry which manufactures, distributes, and services the machinery and equipment for agricultural pursuits. These may or may not be United States based firms.

Agricultural Mechanization.--The use of hand tools and equipment, animal powered equipment, and engine powered equipment for the production, transportation, storage, and processing of agricultural goods.

Elementary Education.--Education for the grades one through eight.

Secondary Education.--Education for the grades nine through twelve.

Post-Secondary Education.--Education beyond grade twelve but not directed towards a university degree.

Limitations of the Study

This study was limited to the perceptions of individuals who were experienced in agricultural mechanization in developing countries. A total of thirty-three developing countries were represented by the eighty-six respondents. No attempt has been made to make specific statements about individual countries due to the limited number of responses from each country.

This was not a study to determine the value of various educational activities but to determine the appropriateness of the agricultural equipment industry participating in these activities.

CHAPTER II

BASES FOR THE STUDY

Introduction

The primary concern of this study was to assess the appropriate role of the agricultural equipment industry in agricultural mechanization education in developing countries, as perceived by individuals who have had agricultural mechanization experience in developing countries. This study derived its base from two distinct areas of concern. The first was to identify the areas of educational deficiencies in developing countries and, more specifically, agricultural mechanization education. The second was to identify activities conducted by non-governmental agencies in assisting the development of education, and again more specifically, agricultural mechanization education in these developing countries.

Educational Deficiencies

Value of Education

The development of human knowledge and skills is an essential component for developing countries. The world's more advanced countries have long assigned a high priority to increasing knowledge through research

and to increasing the level of education for all of the people. Dean Rusk's statement of 1962 is still appropriate today:

> I think if we look at the problems of development in country after country outside the West, we shall find that people are the bottleneck, and this means that education has a crucial role to play. And this I suspect is the great difference between the possibilities of a program like the Marshall Plan and the problems of the developmental programs in the non-Western parts of the world which we see at the present time.[1]

Measurements of Education

There are many methods of examining the state of education in developing countries. To some it may be a series of statistical tables listing the percentage of the population that is literate, the percentage of the population of a certain age group which is enrolled in school, the number of schools per 1000 population, or the number of school teachers of a particular level per 1000 population. Such information is valuable in making judgments about the education but this is not sufficient without further delimitation.

Statistics on literacy levels may be misleading as there are many different definitions of literacy. UNESCO defines literacy and illiteracy as:

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[1]As quoted in John W. Hanson and Cole S. Brembeck, Education and the Development of Nations (New York: Holt, Rinehart and Winston, 1966), p. 31.

> A person is literate who can with understanding both read and write a short simple statement on his everyday life.
> A person is illiterate who cannot with understanding both read and write a short simple statement on his everyday life.[2]

Note that no reference is given to any particular language although some countries have chosen to further limit this definition by adding a specific language or languages. Others have given it a more liberal interpretation by stating one must be able to read or write rather than read and write. Some countries use the term "functional literacy" and this would normally require more education than the UNESCO definition. By United States standards, the completion of the fourth grade is a requirement for literacy.

A measurement of the number or percentage of school-aged children that are in school is not a completely satisfactory "yardstick" of education either as these figures seldom supply information on daily attendance, length of school day or length of school term.

Miseducation

The quality of the education in many of the developing countries is low by Western standards. Often school curricula at all levels of instruction are characterized by excessively repetitious work and emphasis on details.

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[2]UNESCO, Manual of Educational Statistics (1st ed.; Paris: UNESCO, 1961), pp. 40-41.

Teaching methods are rigid, with emphasis on memorization rather than developing a spirit of inquiry and the power of observation. Class instruction often bears little relationship to everyday experiences. Curle makes reference to some of the miseducation we find in developing countries:

> The major instrument for producing the people to undertake the education of a country is the educational system. But having made this statement, I must immediately qualify it. The wrong sorts of education, or disproportionate amounts of education not intrinsically undesirable, can be even more wasteful of human and economic resources than too little. Before attempting to say what might be done, we must examine some of the things which are wrongly done.[3]

Hanson cites numerous cases where we have "confused schooling with education" in his stimulating and concise monograph on miseducation in Africa. In an attempt to prevent lowering of standards, the educated Africans have remained chary of innovations.

> Too many have not yet come to recognize that genuine Africanization of the curriculum involves more than changing science illustrations from oak leaves to palm fronds, or weeding out such palpable nonsense as the alleged requirement that Africans in the former French areas memorize and repeat, "Our ancestors, the Guals, were tall men with fair hair and blue eyes."[4]

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[3]Curle, op. cit., p. 82.

[4]John W. Hanson, Imagination and Hallucination in African Education (East Lansing, Michigan: Michigan State University, no date), p. 13.

Centralized examination systems which command the nature of instructional programs is another area that Hanson criticizes.

> Centralized examinations, generally externally controlled, have been viewed in Africa as elsewhere as the surest means of "maintaining standards." Persistent reliance in such tests upon the content familiar in France, Belgium, or Britain has been further complicated by an emphasis upon types of questions which stressed mastery of a body of factual knowledge. "Examination dominance," to an extent difficult for an American to believe, exercises a control over all schools below the university. When coupled with the belief in exact equivalence with European standards, the ridiculous situation develops where vocational students are expected to master the syllabus of the City and Guilds of London, resulting in such phenomena as students building European-style fireplaces in the 120 degree heat of Khartoum, Sudan, or hanging wallpaper in tropical climates which preclude its use.[5]

Educational Levels

Another aspect of the educational systems of developing countries which needs to be examined is the lack of adequate vocational and technical education. Too much of the education in the developing countries has been directed towards the preparation for the university, which is currently within the possible realm of attainment for only a very small percentage of the students, or towards employment in a "white collar" position within the cities. Greater emphasis must be placed on education that has

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[5] Ibid., p. 15.

more immediate value to a larger portion of the countries' youth. Shane amplifies this by stating: "Each year (of schooling) must result in outcomes immediately useful in the society in order to be of value to the students who will go no further."[6]

Too often the educational system in developing countries have been patterned after those in more developed countries where the majority of the students complete at least twelve years of formal schooling.

> Primary and university levels of instruction have generally dominated the educational systems of developing countries. Provisions for vocational and technical training are usually considered inadequate, particularly in view of the great need for technicians in most underdeveloped countries.
>
> There is often little demand for vocational schooling among students, just as there is little demand for technical subjects in secondary schools of general instruction or in universities. Prestige is primarily, if not exclusively, associated with highly academic subjects such as the humanities and the fine arts. These subjects are emphasized as preparation for the professions of law, medicine, and civil service, which are highly esteemed because of their association with the governing class.[7]

Even where vocational or technical education has been included in the educational program, too often the content of the education has been a "watered-down"

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[6]Harold G. Shane, ed., The U. S. and International Education, The Sixty-Eighth Yearbook of the National Society for the Study of Education (Chicago: The University of Chicago Press, 1969), p. 359.

[7]Changes in Agriculture in 26 Developing Nations, Foreign Agricultural Economics Report No. 27 (Washington: United States Department of Agriculture, Economic Research Service, November, 1965), p. 72.

version of the university course in agriculture rather than a unique program to meet the direct needs of the students and the country.[8]

Teacher Supply

One of the difficulties the educational system has had is to properly train and retain an adequate supply of teachers, particularly for the rural segment of the country.

> . . . teachers have viewed their education as a means of escaping the confines of the village; and with other young educated persons they tend to gravitate, if possible, toward the lights of the city--in some countries even preferring unemployment in the city to "exile" in a remote community where their services are needed.[9]

The value of teachers and teacher training is further stressed by Curle:

> Teacher training is one of the nerve centers of the education system. More can be done to raise standards of education and at less cost through teacher training than any other activity. But in the underdeveloped countries relatively little attention has been paid to this urgent task. In Africa, for example, the average number of children per teacher is 37.6 as against 26.6 in the countries of North America, Western Europe, and Australia. Moreover, in Africa fewer than half the teachers have themselves had any training whatsoever beyond an exiguous primary schooling.
>
> Any government which desires to promote development should therefore select, train, pay,

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[8]Clifton R. Wharton, Jr., "Education and Agricultural Growth: The Role of Education in Early-Stage Agriculture," in Education and Economic Development (Chicago: Aldine Publishing Co., 1966), p. 218.

[9]Hanson, op. cit., p. 24.

> and provide for the further education of its teachers more lavishly and efficiently than is the rule.[10]

Agricultural Education

Another deficiency area is the lack of inclusion of agriculture in the schools' curricula. For at least thirty years there has been talk of importing an "agricultural basis" into rural education, but in most countries this has hardly developed beyond the stage of pious hope.[11] Farming is left to the illiterate people as the educated ones tend to move away and farm only if forced to do so. Kline et al. point out the deficiency of trained operators in the field of agricultural mechanization at both animal and engine powered levels of mechanization, and state that practically no attention has been given to training farmers and private contractors in the field of agricultural mechanization.[12] The summary of a comprehensive study by Mackson further emphasizes the need for trained middle level personnel:

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[10] Curle, op. cit., p. 148.

[11] "Agricultural Education in Africa," Overseas Quarterly, IV, No. 3 (September, 1964), p. 79. (Extracts from a Report on the Seminar on Agricultural Education, Kampala, Uganda, September, 1963).

[12] C. K. Kline et al., Agricultural Power in Equatorial Africa, (Preliminary Draft) (East Lansing, Michigan: Michigan State University, 1969), pp. 1-89.

> The feasibility study indicated a great need for trained technicians in all aspects of agricultural mechanization in the developing countries visited. Not only is there a need for more adequately trained tractor owners and operators but also for better informed dealers, company representatives, government officials and others working in various phases of agricultural mechanization.[13]

Image of Agriculture

From the aforementioned information it appears essential to make additional efforts to improve the education of the developing countries, especially the agricultural and rural sector. One of the first steps is to improve the image of agriculture so it is able to shed the terms "serf," "peasants," or "peon" which are commonly associated with it.

> Unless farming can be made to offer a reasonable livelihood and satisfactory condition of employment, there is no real point in attempting to gear the teaching in schools and colleges to encourage young people to enter rural occupations.[14]

If we are to upgrade the image of agriculture, it appears essential that instruction in improved agricultural methods be incorporated into the school programs. Agricultural mechanization appears to be one of the desired areas of instruction as it not only increases the

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[13]Chester J. Mackson, A Feasibility Study of Agricultural Mechanization Training in Selected Developing Countries (East Lansing, Michigan: Michigan State University, 1969), p. 1.

[14]"Agricultural Education in Africa," op. cit., p. 79.

agricultural productivity per man but also minimizes the drudgery of farm work. By using the broad definition of agricultural mechanization as given by Kline et al., we see that some form of agricultural mechanization can fit into any stage of agricultural development.

> Mechanization has been defined as the use of hand and animal operated tools and equipment, to reduce the human effort, improve the timeliness and quality of various farm operations, thereby increasing yields, quality of product and overall efficiency of operation.[15]

If agricultural training is to be expanded into the schools, it is essential that training programs be designed and executed in such a manner that students respect and enjoy practical training and do not regard it as undignified menial labor.[16]

Education and Private Industry

Private industry is playing a large and important role in the area of international education but further exploration needs to be conducted in this area. The United States Congress recognizes the vital role of free enterprise in achieving rising levels of production and living standards essential to economic progress and development. This is shown in Section 601 of the Foreign Assistance Act of 1961:

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[15]Kline et al., op. cit., p. i.

[16]"Agricultural Education in Africa," op. cit.

> In order to encourage and facilitate participation by private enterprise to the maximum extent practicable in achieving any of the purposes of this Act, the President shall:
>
> (1) make arrangements to find, and draw the attention of private enterprise to, opportunities for investment and development in less-developed friendly countries and areas. . . .
>
> . . . . . .
>
> (4) wherever appropriate carry out programs of assistance through private channels and to the extent practicable in conjunction with local, private or governmental participation, including loans under the authority of section 201 to any individual, corporation, or body of persons.[17]

Coombs emphasizes the cooperation and understanding that must exist between the private sector and government in order to make more complete use of private capabilities:

> A strategy for federal educational aid openly arrived at in consultation with non-governmental experts and leaders, would also be of great advantage to the private sector. For if the Government makes clear its own purposes and intentions and brings greater order to its own household, private groups will have sounder ground for making their own decisions and can contribute more effectively to the total national effort.
>
> The bulk of private effort in this realm is and should be entirely independent of government influence and financial support. But the private sector has an important additional role to play, in helping the government carry out its own policies and programs as, for example, when universities contract with AID to operate overseas projects or when professional organizations contract with the State Department to administer various exchange programs.[18]

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[17] International Development Act of 1961, Section 601(b), 75 Stat. 438 (1961).

[18] Coombs and Bigelow, op. cit., p. 34.

To develop a better understanding of the magnitude of the private sector's contribution in international development, it is necessary to look at some of their activities. In 1966 there were close to a million American businessmen and their families living abroad, of which approximately 200,000 were actually engaged in business.[19] The number is increasing all the time and they carry on a large number of projects. American industries in Caracas, Venzuela, for example, have a budget of $600,000 each year for educational, artistic, and related programs.[20] In a census conducted by the Institute of International Education, it was found that ninety-seven American corporations brought to the United States 4,800 trainees in a single year.[21] This number compares favorably with the number coming through organizations of governmental agencies such as the Department of State.

The question now appears to be not one of whether the private sector should assist in education in developing countries but how can it best assist. Is it more appropriate for the private sector to provide assistance within the context of the established educational system

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[19]William Y. Elliott, Education and Training in Developing Countries (New York: Frederick A. Praeger, 1966), p. 291.

[20]Ibid.

[21]Ibid.

or work outside the educational framework? Should their assistance programs be conducted within the developing countries or provide for students to study in more developed countries? Should the assistance be directed towards the university, secondary, or primary level? These are just a few of the questions that need to be answered if the maximum returns are to be received on the investment of the private sector.

Higher Education

At the higher education levels, there are real shortages of qualified personnel well trained in the field of agriculture. Wharton states that very few of the leaders involved in agricultural policy making in developing countries are specifically trained in agriculture.[22] Mackson cites a case where an agricultural college in Iraq was not able to open its doors in the fall quarter of 1968 due to shortage of professors and technicians.[23]

There are numerous examples of private firms providing scholarships for higher education students. Speakman lists several organizations which contribute to the education of youth from developing countries by providing funds for them to study abroad.

> American Overseas Petroleum, Ltd. has a scholarship program for six students from Indonesia, Turkey, and Libya to study in the United

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[22]Wharton, op. cit., p. 219.

[23]Mackson, op. cit., p. 26.

> States. Sankie Scholarships have been established recently by Chigio Mizuno, a Japanese industrialist, for twenty Japanese undergraduates to study in the U. S. This program began in September of 1965. Xerox sponsored a Xerox International Fellowship for Mexico as of 1965-66. In 1965 Braniff International Airways, Pan American Grace Airways, and Pan American Airways supplied funds to offset the living expenses of foreign graduate students in the U. S., in cooperation with a program of the Institute for International Education and the Council of Graduate Schools. Last year more than thirty firms gave unrestricted grants to the Institute for International Education while others continued to support already established programs for scholarships from abroad.[24]

Many United States agricultural equipment firms are also engaged in this activity.

Providing scholarships for students from a developing country to study outside their home country has its drawbacks though as explained by Ryan.

> The reason why we started al-Hikma University was because we found that some of the most promosing students were going abroad and staying abroad; they would not come back. As a result, the country was losing its best youth. Therefore, the more the United States, especially through private groups, can do in various programs to develop education in foreign countries, the better it will be for all concerned.[25]

A good example of private sources assisting in higher education within a developing country is Egerton College near Nakuru, Kenya. Although there were only

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[24]Cummins E. Speakman, Jr., International Exchange in Education (New York: The Center for Applied Research in Education, Inc., 1966), p. 72.

[25]As quoted in Elliott, op. cit., p. 316.

360 students enrolled in 1966-67, there were twenty-one different private organizations sponsoring students there.[26] These organizations included banks, trust organizations, oil companies, chemical firms, and agricultural firms such as canneries, sugar companies and marketing cooperatives.[27]

Technical Education

In the field of agricultural mechanization, considerable help can be supplied at the technical level by tractor and equipment manufacturers and their agents in the countries concerned. Boshoff suggests that when large amounts of new agricultural equipment are supplied, the manufacturer should send both operator-instructor and field service personnel for sufficient periods to insure that all concerned are adequately instructed.[28] Boshoff cites the following case where this is being conducted in Africa:

> One of the biggest manufacturers maintains a permanent Product Training Representative in Africa, who is available to give short, 2-3 week, courses in any country. Such courses on workshop practice, which are intended primarily for

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[26] College Catalogue (Nakuru, Kenya: Egerton College, 1966), p. 3.

[27] Ibid.

[28] W. H. Boshoff and G. G. Corbett, Report on Agricultural Engineering Training and Education in Africa (Rome: UNFAO, 1965), p. 39.

> dealers' personnel, can often be attended by Government mechanics. Finally, manufacturers can give assistance in the organization of stores and the training of storemen and of clerks responsible for ordering spare parts. These are essential functions, demanding some technical knowledge, which are often not given their due importance in Government establishments. The result is that workshop foremen and even professional officers often spend a considerable portion of their time ordering and "chasing" spare parts.[29]

In Zambia, the African Farm Equipment Company assists in agricultural mechanization education by training operators for their clients.[30] In Rhodesia, the commercial farm equipment agencies and distributors train the majority of the farm mechanics.[31]

There are numerous opportunities for the agricultural equipment industry to assist in agricultural mechanization education at the technical level by providing aids to established educational programs. Mackson points out some of the problems that exist at this level and suggests that the agricultural equipment industry might be interested in further study of these problems with the aim of improving the effectiveness and efficiency of the many instructors already in the field:

> (a) There is an indescribable lack of the most basic training aids, textbooks and other teaching materials.
> (b) Many of the instructors are not trained teachers and as a result have not developed the techniques required to use the available materials to their best advantage.

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[29] Ibid. [30] Ibid., p. 102. [31] Ibid., p. 84.

(c) There are several sources of information and assistance available; however, these are difficult for the instructor in the field to identify.[32]

Another area in which the agricultural equipment industry can make a contribution is assisting the educational institutions in obtaining modern agricultural equipment to use for teaching and demonstration purposes with the students. Kline et al. provide the following suggestions and guidelines on this subject:

> Obtaining loans of equipment and gifts of funds for training institutions from the various important companies of a country requires considerable diplomacy between the appropriate government departments, college administrations and the companies. Clearly, a considerable fund of good will can be established in this way between both the training institutions and the companies, and between potential customers (students) and the companies.
>
> The following guidelines are presented:
>
> 1) Principal manufacturers and dealers may be requested to give special discount privileges to training facilities.
> 2) Training facilities should be willing to meet the costs of repair.
> 3) Local dealers can provide instruction and demonstration in the current use of equipment.
> 4) Literature of all types, especially written in appropriate languages, should be available from equipment dealers.
> 5) Equipment on loan should on no account be used for commercial purposes.
> 6) Several brands of equipment should be represented in the training institution (although governments should attempt to limit the number of types in practical operation in any one location).
> 7) Consignment of equipment should be renewable on an annual basis by mutual agreement between dealers and teaching institutions.

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[32] Mackson, op. cit., pp. 45-46.

8) Major machinery importers should be gained to support adequate training programs.
9) Machinery companies who benefit from trained personnel in their employment should be willing to provide funds and equipment to the training facilities.[33]

Summary

Some of the educational needs of developing countries, both needs for additional education and needs for redirection of emphasis on present education, have been presented in this chapter. In the past, much of the educational emphasis has been directed towards higher education and education for "prestige" or "white collar" jobs. A greater emphasis needs to be placed on education for the masses and education that has more immediate application. Vocational and technical education have been slighted in the past and need to be expanded.

Agriculture has been considered by many of the youth of developing countries as a lowly occupation and they have used education as a means of moving away from agriculture to the bright lights of the cities. This has caused a "brain drain" from rural to the urban centers. If more of the educated youth are to be retained in the rural areas, the image of agriculture must be improved. The introduction of more agriculture education, particularly agricultural mechanization education, is one method of accomplishing this as the goals of agricultural

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[33]Kline et al., op. cit., pp. 123-124.

mechanization are to increase the productive capacity of the farmer and reduce the drudgery of agricultural labor.

Agricultural mechanization education is new to many of the developing countries and therefore there is a shortage of teachers trained in this area, a shortage of physical facilities and equipment, and a shortage of instructional aids for agricultural mechanization. The agricultural equipment industry has assisted in this area of instruction but it is not known how this industry can best apply its assistance toward the agricultural mechanization education of developing countries.

CHAPTER III

PROCEDURES FOR THE STUDY

Introduction

Early in the study it was discovered that little research had been conducted on agricultural mechanization education in developing countries and even less on the role of the agricultural equipment industry in education in these countries. Prior to developing the proposal, the author conferred with personnel of the Ford Motor Company, Detroit, Michigan and the Farm and Industrial Equipment Institute, Chicago, Illinois to develop a better appreciation of the problems of mechanization in developing countries as viewed by industry. Also attempts were made to identify any research personnel in these organizations had conducted that was relevant to the study. Although information was obtained on some of the educational activities conducted in these countries, only one related study was identified.[1] The author also corresponded with personnel of the Agency for International Development, Washington, D. C., but was unable to identify much research directly applicable to this study.

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[1]Mackson, op. cit.

In order to obtain the perceptions of individuals familiar with the problems of agricultural mechanization in developing countries, a questionnaire was developed and submitted to men who were experienced in this field. To receive the perceptions from the field of education and industry, the questionnaire was mailed to representatives of agricultural mechanization education and the agricultural equipment industry. Albracht,[2] Gleason,[3] and Zareian[4] had successfully used this approach in earlier agricultural mechanization education studies, although Zareian's study was the only one concerning developing countries and it pertained to only one country, Iran. Another dimension was added to this study through the use of overseas mailings to individuals currently working in agricultural mechanization in developing countries. These individuals represented education and industry as well as being of many different nationalities.

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[2]James Joseph Albracht, "A Process for Determining Vocational Competencies for the Performance of Essential Activities for the Sales Functions by Sales Personnel in the Feed Industry, and the Loci at Which the Competencies Could be Taught" (unpublished Ph.D. dissertation, Michigan State University, 1966).

[3]William E. Gleason, "Functions of Industry Approach to Curriculum for Vocational Education" (unpublished Ph.D. dissertation, Michigan State University, 1967).

[4]Soleiman Zareian, "An Investigation and Development of a Technical Curriculum for Technician Preparation in Agricultural Mechanization for Iran" (unpublished Ph.D. dissertation, Michigan State University, 1969).

Additional international perspective was added to the respondent list by the inclusion of the foreign students of Michigan State University and the University of Illinois, who were seeking advanced degrees in either agricultural mechanization or agricultural engineering.

Development of Data Gathering Instrument

Through the review of literature, interviews with representatives of the agricultural equipment industry and representatives of the Agricultural Engineering Department, Michigan State University, a general skeleton of the instrument was developed. The three primary questions appeared to be:

1. Is it more appropriate for the agricultural equipment industry to offer assistance within or outside the framework of the educational systems of the developing countries?
2. At what educational level should this assistance be directed?
3. Should this assistance be in the form of educational aids, financial assistance, or manpower?

A series of questions was developed concerning these three major points.

The questionnaire was submitted to a jury consisting of agricultural educators and agricultural engineers of Michigan State University for their evaluation of the

completeness and clarity of the questions. These jury members were not part of the ultimate respondent list. From these responses, the questionnaire was revised and commercially reproduced (Appendix A). The questionnaire, with cover letter (Appendix B and C), was then mailed to all respondents.

Organization of the Questionnaire

The data gathering instrument was designed to identify the perceptions of the respondents in five major areas, hereafter referred to as clusters, with nine or ten questions in each of these clusters. It was not intended that the questions be all-inclusive but that they be a representative sample of questions covering a broad spectrum. The respondent was asked to indicate his perceptions as to the appropriateness of the agricultural equipment industry's participation in each individual level or activity on the following five point scale:

5 - Very appropriate

4 - Appropriate

3 - Undecided

2 - Inappropriate

1 - Very inappropriate

For purposes of interpretation, only those items or clusters of items receiving mean scores of 3.50, the mid-point between "undecided" and "appropriate," or above were considered as appropriate for the agricultural equipment industry.

The first cluster consisted of a series of nine questions relative to the appropriateness of the agricultural equipment industry assisting in agricultural mechanization in developing countries within the context of the established educational systems and to determine the level this participation appeared most appropriate. This included both animal and engine powered agricultural mechanization.

Cluster II consisted of a series of questions relative to educational assistance outside the context of the established educational systems of the developing countries. These questions pertained to adult and youth education in the areas of animal and engine powered mechanization.

In addition to the analysis made within Clusters I and II, it was possible to make some general analysis between the two clusters.

The three remaining clusters concerned types of educational assistance in which the agricultural equipment industry might contribute and included items such as charts and printed materials on agricultural machinery; films, slides, and other audio-visual aids; shop tools and equipment; and agricultural tractors and machinery.

Cluster IV consisted of questions pertaining to the appropriateness of the agricultural equipment industry conducting seminars or workshops in the area of

agricultural mechanization for students, teachers, teacher educators, and governmental workers.

The last cluster, V, consisted of ten questions relative to financial assistance the agricultural equipment industry might make in agricultural mechanization education in developing countries and was directed primarily towards scholarships. The questions concerned scholarships to be used both within and outside the home country of the student for non-degree agricultural mechanization education, university degrees, and teacher education. The last three clusters might be referred to as pertaining to "materials," "manpower," and "money" respectively.

The next four items on the questionnaire were directed towards the appropriateness of United States personnel working in developing countries in the area of teaching and advising on short term assignments of six months or less and long term assignments of more than six months.

Selection of Respondents

United States Educators

To identify United States agricultural mechanization and agricultural engineering educators who had received experience in developing countries, a letter was mailed to the chairman (Appendix D) of each of the thirty-eight agricultural engineering departments in the United States

accredited by the Engineering Council for Professional Development as listed in the 1968 ASAE Yearbook.[5] This letter requested the names of their staff members who had worked in the area of agricultural mechanization or agricultural engineering education in a developing country for at least one year out of the past ten years. All department chairmen responded to these letters and a list of forty-one names was compiled. All of these individuals were mailed a questionnaire. Seven stated, in their response, they were not qualified due to length of stay being less than one year, their experience being more than ten years ago, or they had not been involved in agricultural mechanization or agricultural engineering education. One returned a non-usable form and two did not respond. This provided thirty-one usable questionnaires for a 91 per cent response of the qualified individuals.

Foreign Graduate Students

Twenty-one foreign graduate students seeking advanced degrees in agricultural mechanization or agricultural engineering at Michigan State University and the University of Illinois were identified and mailed questionnaires. Twenty of these completed and returned the questionnaire for a 95 per cent return.

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[5] 1968 ASAE Yearbook (St. Joseph, Michigan: American Society of Agricultural Engineers, May, 1968), p. 175.

United States Agricultural Equipment Industry Respondents

Through correspondence with the former chairman of the Foreign Trade Committee of the Farm and Industrial Equipment Institute, a list of seven major agricultural equipment firms involved in agricultural mechanization in developing countries was compiled. Each of these was mailed a questionnaire. Five of these returned usable forms, one responded with a letter stating they did not care to participate and one did not respond, thus providing a 71 per cent usable return.

Overseas Personnel

A list of forty-three men actively involved in agricultural mechanization in developing countries was formed through consultation with staff members of the Agricultural Engineering Department of Michigan State University. The men selected represented experience in many different countries, were of a variety of nationalities, and represented education and industry. Thirty responses were received from this group for a 70 per cent return.

Summary of Respondents

A total of 86 usable questionnaires were returned out of a total of 105 for an 82 per cent return. These represented thirty-three different countries and consisted of United States and non-United States personnel

from the field of agricultural mechanization-engineering education and the agricultural equipment industry.

Classification of Respondents

Classification by Nationality and Profession

As hypothesis 10 concerned the perceptions of the respondents by nationality and profession, the respondents were classified into United States and non-United States personnel. Professionally, they were classified as representing education, industry, students, and others. The "others" included administration and research personnel not actively engaged in either teaching or industry, e.g., FAO administrators. For analysis of perceptions by occupations, only the education and industrial groupings were used as the graduate students did not represent any particular occupation and the "others" were not a homogeneous occupational group.

Classification of Countries

Provisions were made in the questionnaire for each respondent to indicate the developing country in which he had the most agricultural mechanization experience. The respondent was instructed to use this country as the focal point in guiding his response to the questions. From this information, the author was able to identify thirty-three developing countries. Four respondents

indicated they had not worked in any particular developing country but had worked in many developing countries for shorter periods. These were placed into a thirty-fourth classification designated "world wide."

In order to test hypothesis 11, these countries were divided into groups by geographical location, levels of economic development, and levels of educational development.

Geographical Classification

Mackson recommended the establishment of educational centers according to geographical locations throughout the world.[6] There are advantages to this grouping system as these countries tend to have the same language and similar culture and traditions. However, countries in similar geographical locations may differ considerably in stages of economic development and levels of educational development. The four geographical groupings used in this study are shown in Table 1.

Economic Development Classification

Russett states it is not universally accepted that it is possible to classify countries by their stages of economic development but suggests:

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[6]Mackson, op. cit., p. 37.

TABLE 1.--Geographical classification of countries.

Group I Mediterranean and Middle East	Group II Sub-Sahara Africa
Iran	Ethiopia
Iraq	Kenya
Jordan	Liberia
Saudi Arabia	Nigeria
Tunisia	Sierra Leone
Turkey	Tanzania
United Arab Republic	Uganda
Group III **South Asia**	**Group IV** **South and Central America**
Afghanistan	Brazil
Burma	Chile
India	Colombia
Indonesia	Costa Rica
Pakistan	Guiana
Philippines	Jamaica
New Hebrides	Mexico
Taiwan	Panama
Thailand	Peru
	Uruguay

> . . . if one thinks of stages theory not in any rigid sense, but in terms of seeking consistent patterns and relationships at various levels among variables, it would be rash to dismiss it before a careful examination of relevant data.[7]

Although gross national product per capita is frequently employed as a measure of comfort or well being, it has some hazards. If the income is concentrated in the hands of a wealthy minority, the gross national product per capita will not reflect the welfare of the majority.[8]

As increasing the level of agricultural mechanization normally calls for additional capital investment, the gross national product per capita measurement appeared relevant to this study. The thirty-three countries of the study were divided into four classifications according to the 1966 estimated gross national product per capita (Table 2). Group I consists of countries with an estimated 1966 gross national product per capita of less than $100 (United States dollars at 1964 exchange rate). Group II consists of countries with a gross national product per capita of $101 to $200, Group III ranged from $201 to $300, and Group IV were the balance which ranged from $354 to $569.[9]

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[7]Bruce M. Russett, World Handbook of Political and Social Indicators (New Haven and London: Yale University Press, 1964), p. 293.

[8]Ibid., p. 151.

[9]USAID, Selected Economic Data for Less Developed

TABLE 2.--Economic classification of countries.[a]

Group I Primitive	Group II Traditional
Afghanistan	India
Burma	Liberia
Ethiopia	Nigeria
Indonesia	Philippines
Kenya	Thailand
Pakistan	Tunisia
Tanzania	United Arab Republic
Uganda	
Group III Transitional	**Group IV Industrial Revolution**
Brazil	Chile
Colombia	Costa Rica
Guiana	Jamaica
Iran	Mexico
Iraq	Panama
Jordan	Peru
Taiwan	Saudi Arabia
Turkey	Uruguay

[a]New Hebrides and Sierra Leone not included as comparable data was not available.

Data Source: Selected Economic Data for Less Developed Countries, Economic Trends (Washington: Statistical and Report Division, June, 1967), pp. 2-8.

Educational Development Classification

As educational plans differ throughout the world, it appeared somewhat of a problem to arrive at a meaningful educational scale. Russett suggested the percentage of the population, ages five through nineteen, enrolled in primary and secondary education as a measure of educational development.[10] By combining primary and secondary education, we avoid many problems of incomparability as to the distinction actually drawn in various countries. For purposes of this study, four classifications were used so as to maximize the internal consistency of the groups (Table 3). The classifications were labeled "primitive," "traditional," "transitional," and "industrial revolution." The countries in the "primitive" classification ranged from 2 to 14 per cent of the population between the ages of five and nineteen enrolled in primary and secondary education. The "traditional" group ranged from 20 to 29 per cent, the "transitional" ranged from 31 to 42 per cent, and the "industrial revolution" ranged from 46 to 59 per cent.[11]

Countries, Economic Trends (Washington: Statistical and Report Division, June, 1967), pp. 2-8.

[10] Russett, op. cit., p. 217.

[11] Ibid., p. 281.

TABLE 3.--Educational classification of countries.[a]

Group I	Group II
Afghanistan	Burma
Ethiopia	India
Liberia	Iran
Saudi Arabia	Nigeria
Sierra Leone	Pakistan
Tanzania	
Uganda	
Group III	**Group IV**
Brazil	Chile
Colombia	Costa Rica
Indonesia	Jamaica
Iraq	Jordan
Kenya	Panama
Mexico	Philippines
Peru	Taiwan
Tunisia	Thailand
Turkey	Uruguay
United Arab Republic	

[a]Guiana and New Hebrides not included as comparable data was not available.

Data Source: Bruce M. Russett, World Handbook of Political and Social Indicators (New Haven: Yale University Press, 1964), pp. 218-220.

Treatment of Data

Information obtained from the questionnaires was transferred to data processing cards and processed by the 3600 computer of Michigan State University. Consultations were held with personnel of the Office of Research Consultation, College of Education, Michigan State University regarding appropriate statistical procedures.

As the first objectives of the study were to identify the educational levels and types of educational activities perceived most appropriate for the agricultural equipment industry to contribute, mean scores of all respondents were obtained for each question and cluster of questions. These were rank ordered to indicate the relative perceived appropriateness of each item and cluster of items.

Other objectives were to determine if there were any insignificant differences among the perceptions of the various classifications of respondents and countries. The one-way-analysis of variance test was used to determine if this difference was significant.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Summarized data and pertinent findings relative to the purposes of the study are presented in this chapter. It is organized into two parts. Part one analyzes the data within each of the clusters of questions and the relationship between these clusters. The second part analyzes the data by various classifications of respondents and countries to determine if significant differences existed within these classifications.

Analysis by Clusters of Questions

Cluster I: Assistance Within the Context of the Established Educational Systems of Developing Countries

Three of the nine items in Cluster I received scores of 3.50 or above, thus placing them in the classification as "perceived appropriate" for the agricultural equipment industry (Table 4). All three of these pertained to agricultural mechanization education in engine powered agricultural equipment. Item 9b, assistance in post-secondary agricultural, trade, and technical schools, received the highest score of 4.71 out of a possible 5.00.

TABLE 4.--The perceived appropriateness of the agricultural equipment industry providing educational assistance at various levels within the established educational systems of developing countries.

Question	Mean Score	Rank
6. Assist in basic literacy education of elementary level students	2.78	9
7. Assist in agricultural mechanization education in elementary schools in the use and care of:		
(a) animal powered agricultural equipment	2.93	8
(b) engine powered agricultural equipment	3.26	5
8. Assist in agricultural mechanization education in the secondary schools in the use and care of:		
(a) animal powered agricultural equipment	3.21	6
(b) engine powered agricultural equipment	4.06	3
9. Assist in agricultural mechanization education in post-secondary, but non-university schools (e.g., agricultural schools, trade schools, and technical schools) in the use and care of:		
(a) animal powered agricultural equipment	3.41	4
(b) engine powered agricultural equipment	4.71	1
10. Assist in agricultural mechanization education in the university level for the:		
(a) animal powered agricultural equipment	3.13	7
(b) engine powered agricultural equipment	4.50	2
Cluster Mean	3.58	

The second ranking item was 10b which pertained to engine powered agricultural mechanization education at the university level. This item received a mean score of 4.50. The third ranking item was 8b which pertained to engine powered agricultural mechanization educational assistance at the secondary level. This item received a mean score of 4.06.

None of the remaining items which pertained to animal powered agricultural mechanization education, basic literacy education, or assistance at the elementary levels received mean scores high enough to classify them as "perceived appropriate" for the agricultural equipment industry's assistance. However, as many attitudes on agricultural mechanization are formed at the elementary level, it may be short-sighted to not involve the agricultural equipment industry in some agricultural mechanization education in the elementary schools.

The above information supports hypothesis one, "The perceptions of the respondents will indicate that it is more appropriate for the agricultural equipment industry to assist at the university and secondary level than at the elementary level when working within the context of the educational systems of developing countries," and hypothesis three, "The respondents will perceive it to be more appropriate for the agricultural equipment industry to assist in engine powered mechanization education than animal powered mechanization education."

Cluster II: Assistance Outside the Context of the Established Educational Systems of Developing Countries

From the responses received to items in Cluster II it appeared that if the agricultural equipment industry was to assist in agricultural mechanization education, outside the context of the educational systems of developing countries, it was most appropriate for this assistance to be in-service education directed towards mechanics and governmental personnel working in the field of agricultural mechanization (Table 5). These two areas received the highest mean scores of 4.69 and 4.58 respectively. The responses also indicated it was appropriate for the agricultural equipment industry to be involved in pre-employment training for mechanics as this item received a score of 4.34 which was third in rank for this cluster. Assisting at the village level in engine powered agricultural mechanization education for out-of-school youth and adults ranked fourth and fifth with scores of 4.01 and 3.89 respectively. All of the above mentioned items received mean scores above 3.50 so were therefore perceived as "appropriate" for the agricultural equipment industry's participation in the agricultural mechanization education of developing countries.

Assisting in basic literacy education and animal powered mechanization education for out-of-school youth and adults at the village level did not appear appropriate

TABLE 5.--The perceived appropriateness of the agricultural equipment industry providing educational assistance at various levels outside the established educational systems of developing countries.

	Question	Mean Score	Rank
11.	Assist in village level basic literacy of:		
	(a) out-of-school youth	3.02	9
	(b) adults	3.03	8
12.	Assist in village level animal powered agricultural mechanization education for:		
	(a) out-of-school youth	3.08	7
	(b) adults	3.16	6
13.	Assist in village level engine powered agricultural mechanization education for:		
	(a) out-of-school youth	4.01	4
	(b) adults	3.98	5
14.	Assist in in-service agricultural mechanization education for governmental personnel working in agricultural mechanization	4.58	2
15.	Assist in training of mechanics. (Not limited to employee of agency conducting the educational service.)		
	(a) pre-employment training	4.34	3
	(b) in-service training	4.69	1
	Cluster Mean	3.81	

for the agricultural equipment industry as these each received scores only slightly above 3.00 which placed them below the "appropriate" level. This information supports hypothesis two, "If the agricultural equipment industry is to assist in education outside the framework of the educational system of a developing country, the respondents will perceive it to be more appropriate for this assistance to be in the training of mechanics than village level literacy education."

Analysis Between Clusters I and II

In comparing Clusters I and II, the results tended to compliment each other. In both cases it was perceived inappropriate for the agricultural equipment industry to become involved in basic literacy education but appropriate for them to participate in technical training and training that had direct application towards engine powered agricultural equipment. It also appeared inappropriate for the agricultural equipment industry to assist in animal powered agricultural mechanization education within or outside the context of the educational systems. This information again supports hypothesis three, "The respondents will perceive it to be more appropriate for the agricultural equipment industry to assist in engine powered mechanization education than animal powered mechanization education."

From the total mean scores of the two clusters it appeared slightly more appropriate for the agricultural equipment industry to assist in agricultural mechanization education outside the context of the educational systems of developing countries than within these educational systems. However, further research would be needed to determine if this difference is significant.

Cluster III: Assistance by Providing Instructional Aids

The purpose of Cluster III was to identify the perceived types of instructional aids that the agricultural equipment industry might most appropriately provide. In this cluster, all items received mean scores in the "appropriate" range of 3.50 or above which gave this cluster the highest total mean score of any of the clusters (Table 6). This indicated the respondents believed this to be an appropriate area in which the agricultural equipment industry might assist. Instructional aids to be used in the classroom, such as charts, printed matter, films, and slides, received a higher rank than laboratory items such as shop tools and equipment, and tractors and machinery. This supports hypothesis four, "The respondents will perceive it to be more appropriate for the agricultural equipment industry to provide software type educational aids, e.g., printed matter, charts, and films, than hardware type aids, e.g., projectors, tools, tractors, and farm equipment."

TABLE 6.--The perceived appropriateness of the agricultural equipment industry providing educational aids to schools.

	Question	Mean Score	Rank
16.	Provide teachers with detailed wall charts concerning the construction, operation, and maintenance of agricultural equipment	4.30	2
17.	Provide printed materials on the operation, maintenance, and repair of agricultural equipment	4.35	1
18.	Provide schools with filmstrips/ slides on the operation, maintenance, and repair of agricultural equipment	4.29	3
19.	Provide schools with educational films on the operation, maintenance, and repair of agricultural equipment	4.28	4
20.	Provide schools with audio-visual hardware such as motion picture projectors, overhead projectors, or slide projectors	3.80	8
21.	Provide schools with shop tools and equipment	3.87	7
22.	Provide schools with tractor assemblies, such as engines, transmissions, and differentials, to be used for teaching purposes	4.23	5
23.	Provide schools with complete cut-away or sectioned tractors to be used for teaching purposes	4.13	6
24.	Loan tractors and other farm equipment to schools	3.69	9
	Cluster Mean	4.12	

It is interesting to note that the respondents ranked the providing of filmstrips/slides and educational films third and fourth but ranked the providing of projectors to utilize these aids eighth. It appeared that the closer an item came to being a capital investment, the lower it ranked on the scale. However, providing educational aids appeared to be a very appropriate area for the agricultural equipment industry to assist and could make a major contribution to the agricultural mechanization education of developing countries.

Cluster IV: Assistance by Conducting Workshops and Seminars

In Cluster IV an attempt was made to identify what educational activities in the area of workshops and seminars would be perceived appropriate for the agricultural equipment industry to conduct in the agricultural mechanization of developing countries. From the responses received, this area of instructional assistance had limited appropriateness. Five of the items received scores of 3.50 or above which placed them in the "appropriate" range. However, none of the items received a mean score above the 4.00 level (Table 7). The item that received the highest score of 3.99 was the provision of in-service workshops, of more than five days length, for agricultural mechanization teachers. The second ranked item pertained to providing representatives to serve on advisory committees

TABLE 7.--The perceived appropriateness of the agricultural equipment industry conducting workshops or seminars on agricultural mechanization.

	Question	Mean Score	Rank
25.	Conduct workshops for students, on subjects such as hydraulic systems or new equipment, with a length of:		
	(a) one to five days	3.40	7
	(b) more than five days	3.19	8
26.	Conduct workshops for in-service education of agricultural mechanization teachers, on subjects such as hydraulic systems or new equipment, with a length of:		
	(a) one to five days	3.77	4
	(b) more than five days	3.99	1
27.	Conduct workshops for elementary school teachers, to inform them of the value of agricultural mechanization, with the length of:		
	(a) one to five days	3.51	5
	(b) more than five days	2.87	9
28.	Provide complete agricultural mechanization training for some agricultural mechanization teachers for the public schools.	3.90	3
29.	Provide representatives to serve on advisory committees for:		
	(a) conduct manpower needs surveys	3.48	6
	(b) evaluate and develop agricultural mechanization curricula	3.96	2
	Cluster Mean	3.63	

for agricultural mechanization curriculum evaluation. This received a mean score of 3.96.

Item 28, "Provide complete agricultural mechanization training for some agricultural mechanization teachers for the public schools," ranked third with a score of 3.90. The undertaking of this activity would require considerable time and investment on the part of the agricultural equipment industry. However, it agrees with Chapter II of this study where it was found that teacher training in agricultural mechanization was one of the main shortages in developing countries. Working with elementary students again ranked near the bottom of the scale and was judged inappropriate.

The findings of this cluster support hypothesis five, "It will be perceived by the respondents to be more appropriate for the agricultural equipment industry to conduct seminars and workshops for agricultural mechanization teachers than for agricultural mechanization students."

Cluster V: Assistance in the Form of Scholarships and Grants

In Cluster V, which pertained to financial assistance for agricultural mechanization education from the agricultural equipment industry, the responses indicated that it was slightly more appropriate for the agricultural equipment industry to make grants to schools for expansion

of agricultural mechanization education than it was to provide scholarships directly to students (Table 8). Scholarships for non-degree training within the home country appeared to be appropriate, however, scholarships for education directed towards a degree appeared to be more appropriately used outside the developing country than within. The responses also showed, when providing scholarships, it was more appropriate for these to be directed towards teachers of agricultural mechanization than non-degree, undergraduate, or advanced degree students of agricultural mechanization. From this information, one might assume that the respondents believed it more appropriate to utilize the multiplying effect obtained by working through teachers rather than working directly with students.

Information obtained from Cluster V does not entirely support hypothesis six, "The respondents will perceive it to be more appropriate for the agricultural equipment industry to provide students scholarships to be used inside the developing countries than outside these countries." The hypothesis is supported at the non-degree level but not at the degree level, advanced degree level, or in the advanced training for agricultural mechanization teachers. At these levels, it appeared more appropriate for scholarships to be awarded for study outside the developing countries. One possible explanation for this is the

TABLE 8.--The perceived appropriateness of the agricultural equipment industry providing financial assistance in the form of scholarships and grants.

	Question	Mean Score	Rank
30.	Provide scholarships for students to attend non-degree agricultural mechanization training centers:		
	(a) within their home country	4.00	3
	(b) outside their home country	3.37	9
31.	Provide scholarships for university students to obtain a degree in agricultural engineering or agricultural mechanization:		
	(a) within their home country	3.45	8
	(b) outside their home country	3.82	6
32.	Provide scholarships for advanced university degrees in agricultural engineering or agricultural mechanization:		
	(a) within their home country	2.86	10
	(b) outside their home country	3.90	4
33.	Provide scholarships for teachers of agricultural mechanization to receive advanced training:		
	(a) within their home country	3.57	7
	(b) outside their home country	4.01	2
34.	Assist agricultural mechanization education by making grants to schools to allow them to:		
	(a) establish agricultural mechanization education	3.86	5
	(b) expand agricultural mechanization education	4.06	1
	Cluster Mean	3.79	

limited agricultural mechanization education facilities available at higher levels in developing countries.

The only item in this cluster that showed much deviation from the norm was item 32a which dealt with scholarships for advanced degrees in agricultural mechanization or agricultural engineering within the developing countries. This item received the low score for the cluster of 2.86 which might again be attributed to the limited number of institutions offering advanced degrees in this area.

Analysis Among Clusters III, IV, and V

Upon examination of the total mean scores of Clusters III, IV, and V it appeared most appropriate for the agricultural equipment industry to participate in agricultural mechanization educational activities by providing instructional aids as Cluster III received a total mean score of 4.12 while Clusters IV and V received total mean scores of 3.63 and 3.79 respectively (Table 9). These figures support hypothesis seven, "The perceptions of the respondents will indicate that it is more appropriate for the agricultural equipment industry to provide educational aids than financial assistance in the form of scholarships or grants, when assisting within the educational system." Hypothesis eight, "The perceptions of the respondents will indicate that it is more appropriate for the agricultural

TABLE 9.--The perceived appropriateness of the agricultural equipment industry engaging in various types of educational activities for the agricultural mechanization education of developing countries.

	Cluster Means	Total Mean Score	Rank
III.	Providing educational aids to schools	4.12	1
IV.	Conducting workshops and seminars on agricultural mechanization	3.63	3
V.	Providing financial assistance in the form of scholarships and grants	3.79	2

equipment industry to provide scholarships or grants than conduct workshops and seminars, when assisting within the educational systems," is also supported with these figures but with limited confidence as the spread between the total mean scores is only 0.16 points.

Teaching versus Advisory Assignments

The last four items on the questionnaire were associated with the appropriateness of the agricultural equipment industry providing funds for United States education personnel to work in developing countries in advisory and teaching capacities. These were sub-divided into short term assignments, six months or less, and long term assignments, more than six months. The responses indicated

a slight preference for teaching assignments over advisory assignments (Table 10).

TABLE 10.--The perceived appropriateness of the agricultural equipment industry providing funds for United States education personnel to work in developing countries.

Item	Mean Score	Rank
35. Provide funds for United States education personnel to serve in advisory capacities on agricultural mechanization in developing countries for:		
(a) six months or less	2.76	3
(b) more than six months	3.77	2
36. Provide funds for United States education personnel to assist in the agricultural mechanization education by teaching in developing countries for:		
(a) six months or less	2.45	4
(b) more than six months	4.02	1

The most striking difference appeared between the short term and long term assignments. The short term advisory assignment received a mean score of 2.76 while the long term advisory assignment received a mean score of 3.77. At the teaching level, the difference was greater as the short term teaching assignment received a score of 2.45 while the long term teaching assignment received a mean score of 4.02.

Several of the respondents added notes to the questionnaire further indicating the inadvisability of short term assignments in developing countries. They

indicated it requires six months to a year to become familiar with the problems and culture of a new country and the advisor or teacher has limited effectiveness during this period. This information supports hypothesis nine, "If United States education personnel are to assist in developing countries, the perceptions of the respondents will indicate that these individuals should serve for more than six months in these positions."

Analysis by Classifications of Respondents

At the initiation of the study there was concern about the possibility of differences in responses due to the varied backgrounds of respondents. In order to test if such differences existed, and if so at what level, the respondents were separated into sub-groups by nationality and occupation. A one-way-analysis of variance test was then performed to identify these differences. This test was performed on the mean scores of each cluster as well as each individual item (Appendix E).

Classification of Respondents by Nationality

The respondents were divided into two sub-groups of United States and non-United States nationalities. Of the eighty-six respondents, forty-three were of United States nationality and forty-three were of nationalities other than United States. In analyzing the mean scores

of the respondents to the clusters of questions, significant differences[1] were identified in Cluster IV, the agricultural equipment industry conducting workshops and seminars, and Cluster V, the agricultural equipment industry providing financial assistance in the form of scholarships and grants (Figure 1). In both instances, the non-United States respondents scored these clusters significantly higher than the United States respondents. In the other three clusters of questions, the non-United States respondents provided a higher mean score for each cluster than the United States respondents, but not at a significant level.

In analyzing the responses to individual questions, there were no items with significant differences in Cluster I. In Cluster II, item 11a, "Assist in village level basic literacy education of out-of-school youth," was scored significantly higher by the non-United States respondents.

In Cluster III, item 20, "Provide schools with audio-visual hardware such as motion picture projectors, overhead projectors, or slide projectors," and item 23, "Provide schools with tractor assemblies such as engines, transmissions, and differentials, to be used for teaching purposes," were both scored significantly higher by the non-United States respondents.

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[1]Significant at the .05 level.

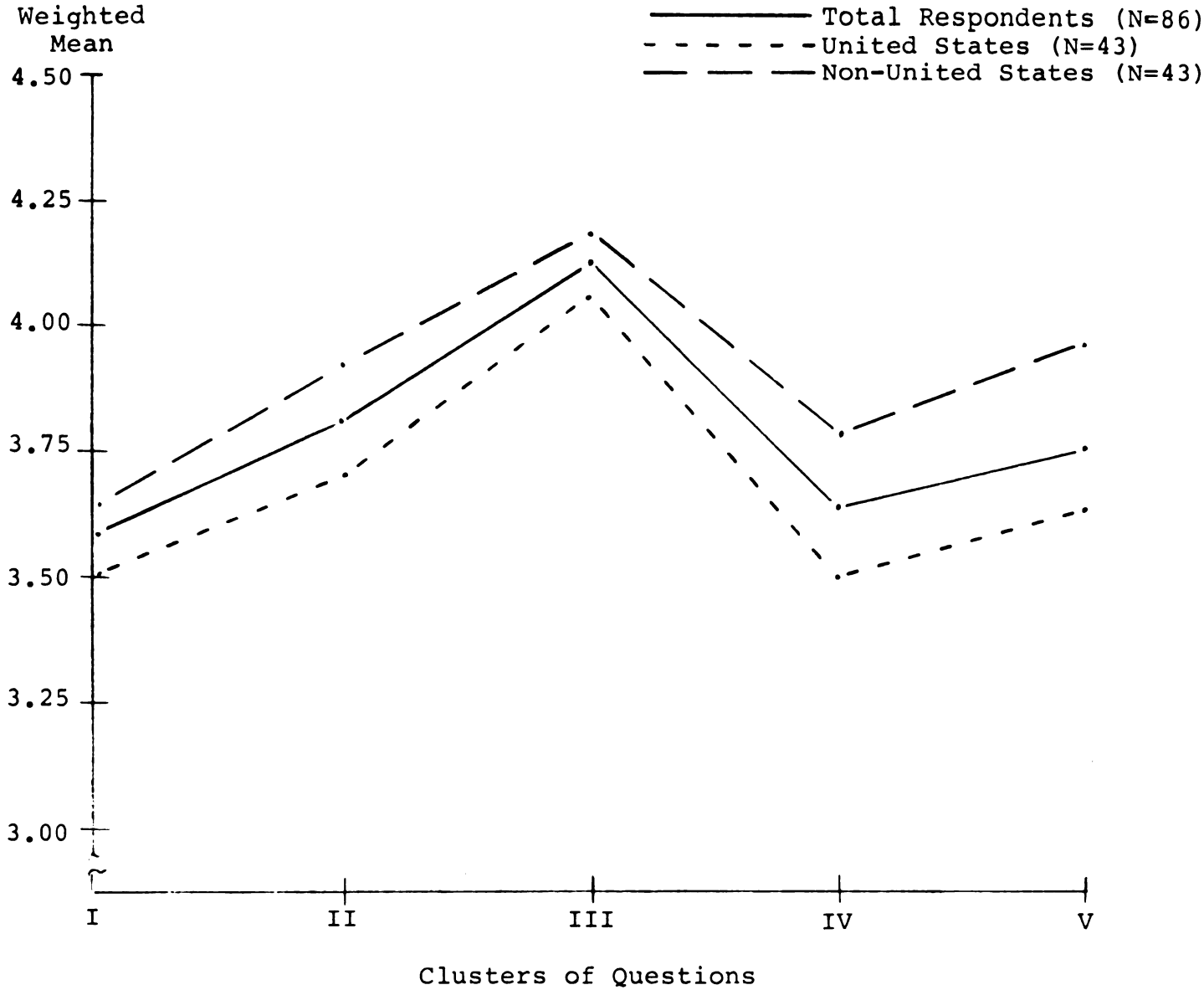

Figure 1.--Mean scores to clusters of questions by respondents representing United States and non-United States nationalities.

Item 29a of Cluster IV, "Provide representatives to serve on advisory committees for conducting manpower needs surveys," was again scored significantly higher by the non-United States respondents. In Cluster V, Item 32b, "Provide scholarships for advanced university degrees in agricultural engineering or agricultural mechanization outside their home country," and item 34b, "Assist agricultural mechanization education by making grants to schools to allow them to expand agricultural mechanization education," both received significantly higher scores from the non-United States respondents.

In the final four questions item 36b, "Provide funds for United States education personnel to assist in agricultural mechanization by teaching in developing countries for more than six months," received a significantly higher score from the United States respondents.

Summary.--Of the fifty questions, there was a significant difference in the mean scores of the United States and non-United States respondents for seven questions. In six of these, the non-United States respondents produced the higher scores and in the seventh, the United States respondents produced the higher score. This indicated that the non-United States respondents perceived it appropriate for the agricultural equipment industry to play a slightly greater role in the agricultural mechanization education of the developing countries than the United States respondents.

Classification of Respondents by Occupations

In order to identify any differences in responses due to different occupations of respondents, they were divided into four sub-groups: education, industry, graduate students, and others. For purposes of this analysis, only the first two classifications of education and industry were used as the graduate students did not represent any particular occupation and the "others" were not a homogeneous occupational group.

In analyzing the mean scores received by the clusters of questions, no significant differences were identified between the responses of education and industry personnel (Figure 2). In analyzing the responses to the individual questions in Cluster I, item 8a, "Assist in agricultural mechanization education in the secondary schools in the use and care of animal powered agricultural equipment," and item 9a, "Assist in agricultural mechanization education in post-secondary, but non-university schools in the use and care of animal powered agricultural equipment," both received significantly higher scores from education personnel. In Cluster II, item 12a, "Assist in village level animal powered agricultural mechanization education for out-of-school youth," also received a significantly higher score from education personnel.

No item in Cluster III or IV received significantly different scores from education and industry personnel.

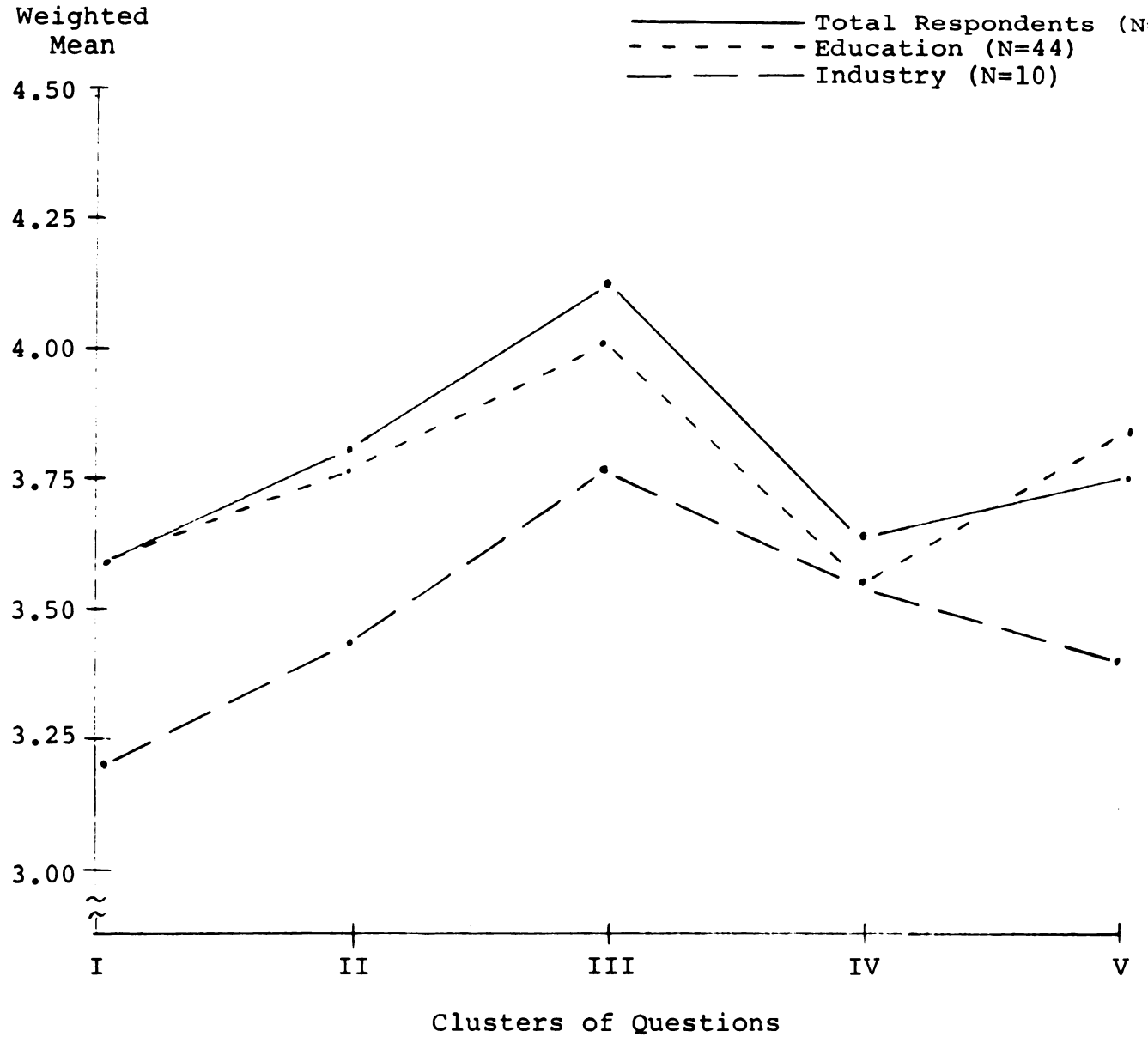

Figure 2.--Mean scores to clusters of questions by respondents representing educational and industrial occupations.

In Cluster V item 30a, "Provide scholarships to students to attend non-degree agricultural mechanization training centers within their home country," item 31a, "Provide scholarships for university students to obtain a degree in agricultural engineering or agricultural mechanization within their home country," and item 33a, "Provide scholarships for teachers of agricultural mechanization to receive advanced training within their home country," all received significantly higher scores from education personnel. From this information, it appeared that education personnel perceived it more appropriate for the agricultural equipment industry to provide scholarships, to be used at various educational levels within the developing countries, than industry personnel.

There were no significant differences in the scores received from education and industry personnel for the remaining four questions.

Summary.--When the responses of industry and education personnel to the fifty individual questions were analyzed, only six items showed a significant difference. However, in each of these cases, the education personnel produced the higher score. This indicated that the respondents representing education perceived the educational role of the agricultural equipment industry to be slightly higher than respondents of industry.

Analysis by Classifications of Countries

As agricultural equipment industry personnel and professional educators assist in educational programs for developing countries, it is desirable to know if certain educational activities are more appropriate for some countries than others. Because of this need, attempts were made to identify any significant differences in the responses to the questionnaire according to various classifications of countries. The countries of the study were classified into sub-groups by geographical location, levels of economic development, and levels of educational development. A one-way-analysis of variance test was performed on each of these classifications to identify the differences in the mean scores received by the sub-groups for each cluster of questions as well as for each individual question.

Classification of Countries by Geographical Location

For this analysis, the countries were divided into the following four sub-groups: Mediterranean and Middle East, Sub-Sahara Africa, South Asia, and South and Central America (Table 1, p. 50). In the analysis of the mean scores for the clusters of questions, there were no significant differences among the scores of the four sub-groups (Figure 3).

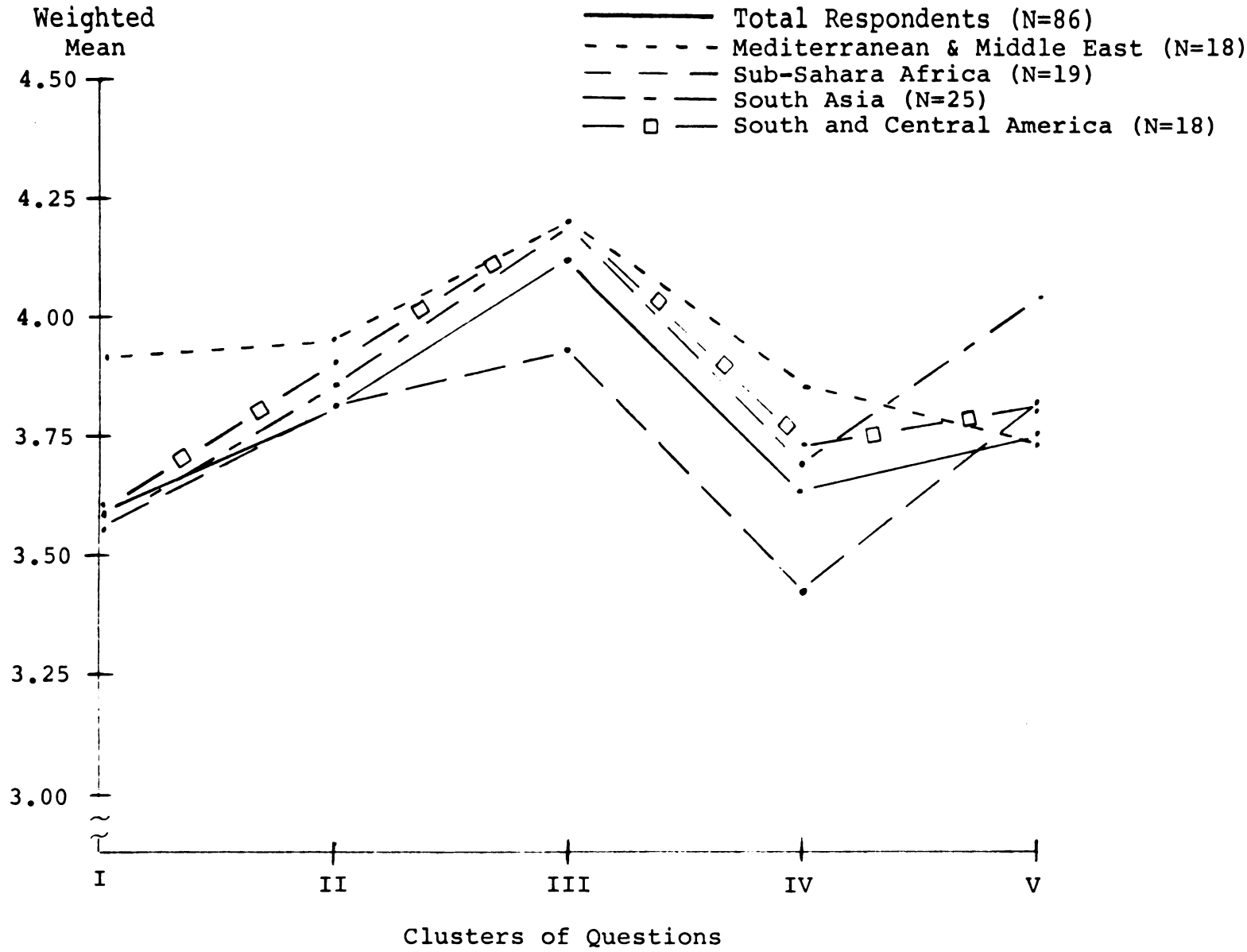

Figure 3.--Mean scores to clusters of questions by respondents representing countries of four geographical areas of the world.

In analyzing the individual questions, a significant difference appeared in the score received by the sub-groups for item 7b, "Assist in agricultural mechanization education in elementary schools in the use and care of engine powered agricultural equipment." The Mediterranean and Middle East sub-group of countries received the highest score of 3.89 with Central and South American countries, South Asia countries, and Sub-Sahara countries following with scores of 3.67, 3.00, and 2.84 respectively.

In Cluster II, a significant difference appeared in item 15a, "Assist in pre-employment training of mechanics." In this case, the highest score of 4.58 was received by the Sub-Sahara countries. The South Asia countries received similar scores of 4.52 and 4.50 respectively while the lowest score of 3.83 was received by the Mediterranean and Middle East countries.

No significant differences appeared in the mean scores received by the sub-groups for individual questions in Clusters III and IV.

In Cluster V, there was a significant difference in the response received by the sub-groups for item 31a, "Provide scholarships for university students to obtain a degree in agricultural engineering or agricultural mechanization within their home country," and 32a, "Provide scholarships for advanced university degrees in agricultural engineering or agricultural mechanization

within their home country." In question 31a, the high score of 4.32 was received by the South Asia countries with the Sub-Sahara African countries receiving a score of 4.10. The Central and South American countries received a score of 3.06 while the lowest score of 2.11 was received by the Mediterranean and Middle East countries. The highest score of 3.47 for question 32a was received by the Sub-Sahara African countries. The second high score of 3.24 was received by the South Asia countries while a score of 2.78 was received by the South and Central American countries. The Mediterranean and Middle East countries received the lowest score of 1.89.

In the final four questions, a significant difference appeared in the scores for questions 35a, "Provide funds for United States education personnel to serve in advisory capacities on agricultural mechanization in developing countries for six months or less," and question 36a, "Provide funds for United States education personnel to assist in the agricultural mechanization education by teaching in developing countries for six months or less." For question 35a, the South Asia countries received the highest score of 3.24 while the Central and South American countries, Mediterranean and Middle East countries, and Sub-Sahara African countries received scores of 3.06, 2.33, and 2.21 respectively. In question 36a, the same

sequence of sub-groupings appeared with the scores being 3.08, 2.72, 1.94, and 1.84 respectively.

Summary.--When analyzed by geographical locations of countries, none of the sub-groups of countries received significantly different mean scores for clusters of questions and only six of the fifty individual questions produced significantly different scores. There appeared to be no pattern as to which group of countries received the highest scores to these six questions.

Classification of Countries by Levels of Economic Development

To provide an analysis of countries by levels of economic development, the countries were divided into the following four sub-groups according to their gross national product per capita. The labels used for these four levels were: primitive, traditional, transitional, and industrial revolution (Table 2, p. 52).

In analyzing the mean scores to the clusters of questions, no significant differences were identified among the four sub-groups (Figure 4). In analyzing the individual questions, a significant difference appeared for item 7a, "Assist in agricultural mechanization education in elementary schools in the care and use of animal powered agricultural equipment." The highest score of 3.70 was received by the "primitive" countries with the "industrial revolution" countries, "transitional" countries, and

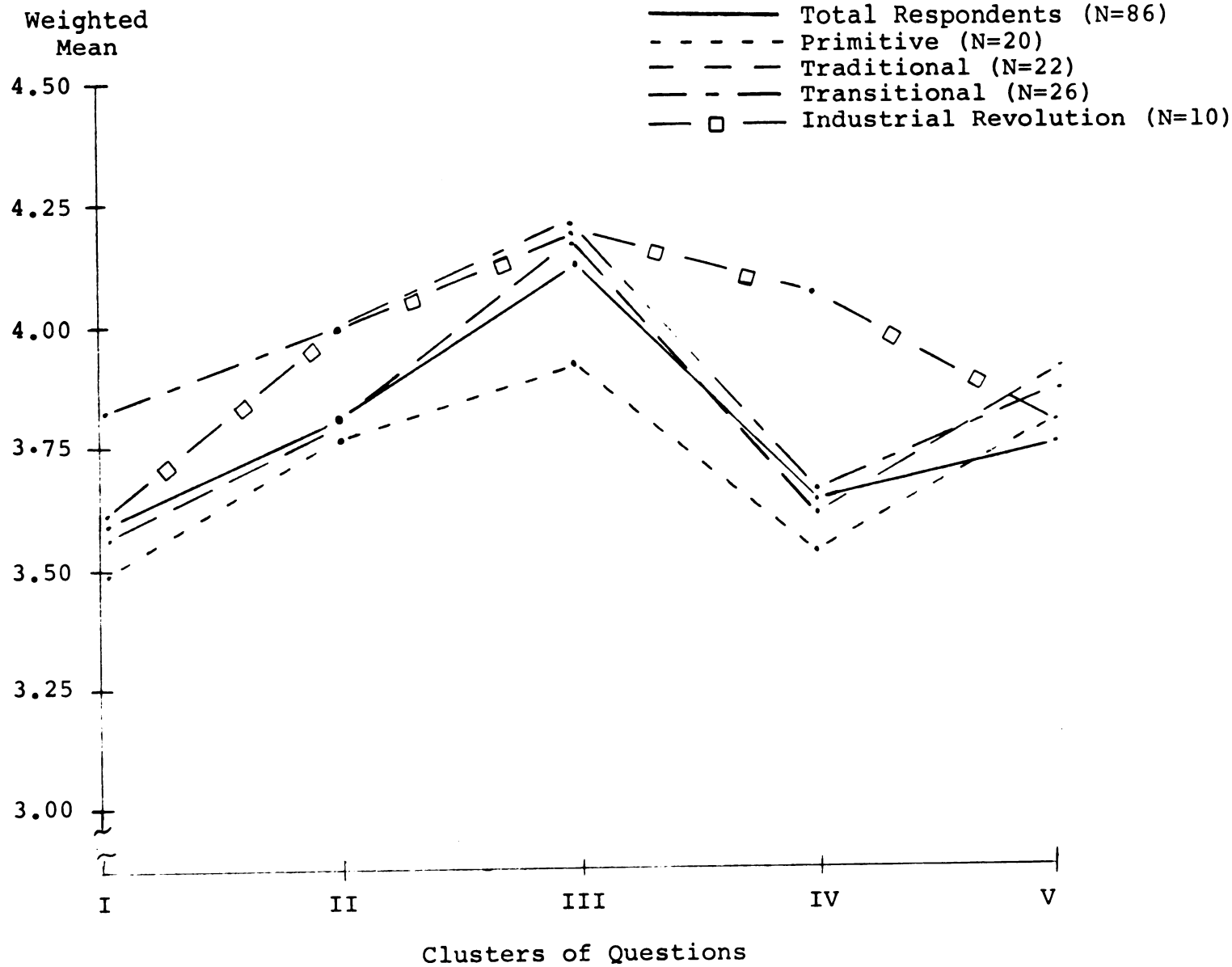

Figure 4.--Mean scores to clusters of questions by respondents representing countries of four levels of economic development.

"traditional" countries receiving scores of 2.90, 2.88, and 2.32 respectively.

There were no items in Clusters II, III, or IV that received significantly different scores. However, in Cluster V, item 31a, "Provide scholarships for university students to obtain a degree in agricultural engineering or agricultural mechanization within their home country," received significantly different scores. The highest score of 4.04 was received by the "traditional" countries. The "primitive" countries received the second high score of 3.90 while the "transitional" and "industrial revolution" countries received scores of 2.96 and 2.90.

Also in Cluster V, item 33a, "Provide scholarships for teachers of agricultural mechanization to receive advanced training within their home country," produced significantly different scores for the sub-groups. The "traditional" countries received the highest score of 4.14 while the "industrial revolution" countries received a score of 3.80 and the "primitive" countries received a score of 3.60. The bottom score of 2.96 was received by the "transitional" countries. No item in the last four questions produced significantly different scores for the sub-groups of countries.

Summary.--When analyzed by levels of economic development, none of the sub-groups of countries received

significantly different scores for the clusters of questions and only three of the individual questions produced significantly different scores.

Classification of Countries by Levels of Educational Development

There was concern that there might be significant differences in responses when the countries were sub-grouped according to levels of educational development. The guide used to establish levels of educational development was the percentage of the youth between the ages of five and nineteen enrolled in primary and secondary education (Table 3, p. 54). Four sub-groups were identified with Level I having the lowest percentage of children in school and Level IV having the highest percentage.

When the mean scores for the clusters of questions were analyzed, no significant difference was identified among the four sub-groups (Figure 5). When the mean scores of the respondents were analyzed by individual questions, a significant difference was found in only two items: 7a, "Assist in agricultural mechanization education in elementary schools in the use and care of animal powered agricultural equipment," and 13b, "Assist in village level engine powered agricultural mechanization education for adults." In item 7a, the highest score of 4.08 was received by education Level I while the other three levels received scores under 3.00 with the lowest of 2.75 going

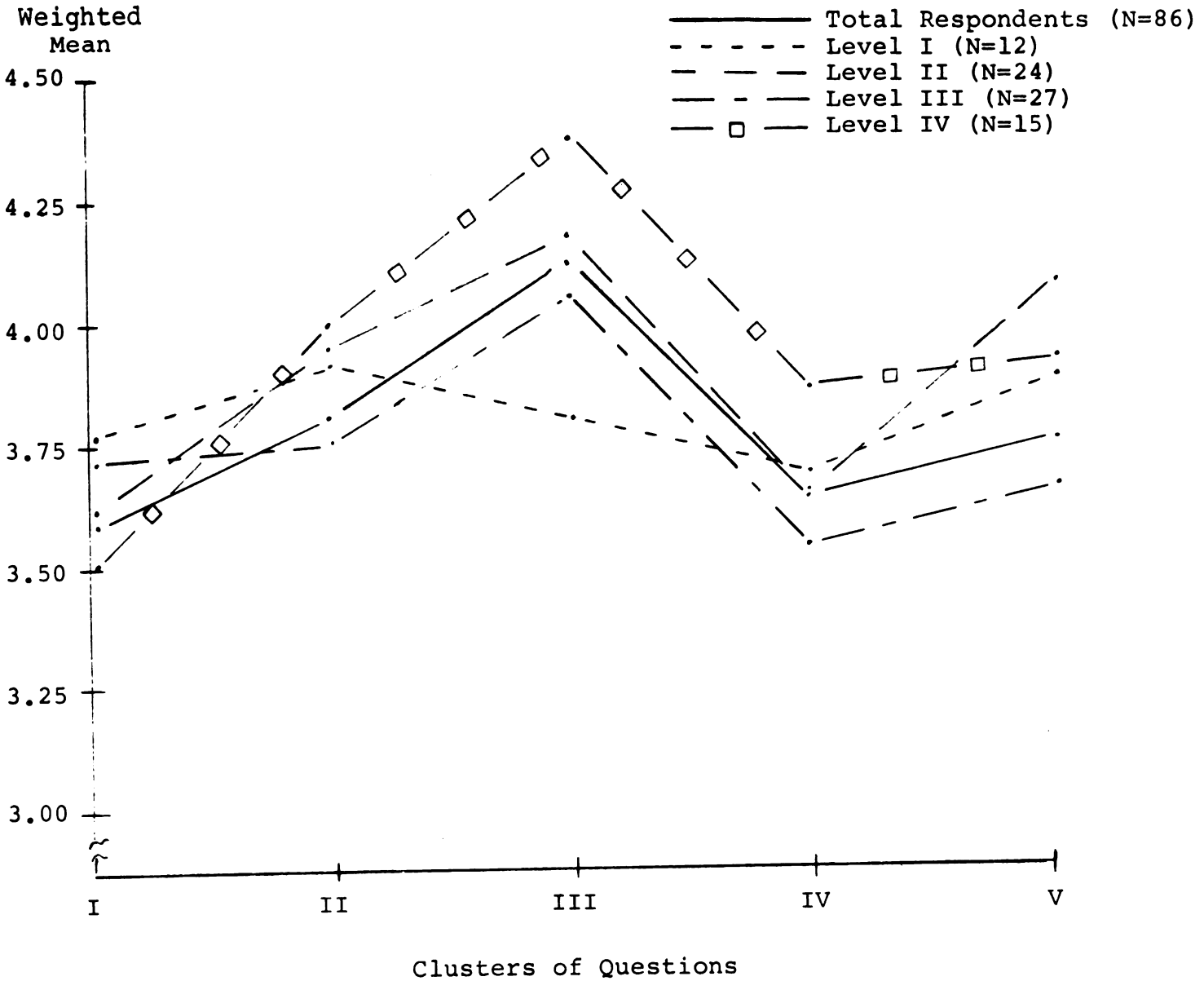

Figure 5.--Mean scores to clusters of questions by respondents representing countries of four levels of educational development.

to educational Level II. In question 13b, the highest score of 4.47 was received by educational Level IV with educational Level II, Level III, and Level I receiving scores of 4.25, 3.89, and 3.33 respectively.

Summary.--When the countries were classified according to levels of educational development, no significant differences were found between the responses of the four sub-groups for any of the cluster means. On individual questions, a significant difference was identified in the responses of the four sub-groups in only two questions.

Summary of Analysis by Classifications of Respondents and Countries

The responses were classified into two different sub-grouping systems by respondents and three different sub-grouping systems by the countries they represented. These responses were then analyzed by the one-way-analysis of variance test. Only twenty-six cases of significant differences of responses, at the .05 level, were identified out of 275 tests. Two of these differences were at the cluster of question level and the other twenty-four differences pertained to individual question. From this information it was interpreted that there was a high degree of agreement among the respondents on the questions in the instrument and there was

very limited value in dividing the respondents or countries into any of the sub-grouping systems tested.

This information supports hypothesis ten, "There will be few significant differences in the perceptions of various sub-groups of respondents, e.g., United States, non-United States, education, and industry, as to the appropriateness of the agricultural equipment industry's participation in various educational levels and educational activities for agricultural mechanization education in developing countries." This information also supports hypothesis eleven, "There will be few significant differences in the perceptions of various sub-groups of countries, e.g., geographical location, economic development, and educational development, as to the appropriateness of the agricultural equipment industry's participation in various educational levels and educational activities for agricultural mechanization education in developing countries."

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This was a study to identify the appropriate role of the agricultural equipment industry in agricultural mechanization education in developing countries as perceived by men experienced in the problems of agricultural mechanization in these countries.

Method and Procedure

A survey instrument was developed through the review of literature and the assistance of representatives of the agricultural equipment industry and university personnel who were experienced in agricultural mechanization education in developing countries. The instrument contained fifty items which were sub-divided into clusters pertaining to the appropriateness of the agricultural equipment industry assisting in agricultural mechanization education within the context of the educational systems of developing countries, assisting outside the educational system of these countries, assistance in the form of instructional aids, assistance in the form of workshops and seminars, and assistance in the form of scholarships and grants.

The instrument was completed by eighty-six individuals who had first-hand experience in agricultural mechanization in a total of thirty-three different developing countries. The respondents were asked to rate each item on the following five point scale as to their perception of the appropriateness of the agricultural equipment industry's involvement in that activity:

5 - Very appropriate

4 - Appropriate

3 - Undecided

2 - Inappropriate

1 - Very inappropriate

Items receiving mean scores of 3.50, mid point between "undecided" and "appropriate," or above were considered appropriate for the agricultural equipment industry's participation.

To identify significant differences that might be due to various experiences and backgrounds of the respondents, they were classified into sub-groups by nationality and occupation. The sub-groups by nationality consisted of United States and non-United States respondents. The sub-groups for the occupation classification consisted of education, industry, graduate students, and "others." For this analysis, only the education and industry sub-groups were used as the students did not represent any particular occupation and the "others" were not a homogeneous occupational group.

To identify differences that might be due to the different countries represented, the countries were classified by geographical location, levels of economic development, and levels of educational development with four sub-groups in each of these classifications.

The mean scores received to questions and clusters of questions by the above classifications were analyzed through the one-way-analysis of variance test to determine the differences within these classifications.[1] Significant differences[2] were found in 26 of the 275 tests.[3]

Summary of Findings

Based on the perceptions of the respondents, the major findings of this study are as follows:

1. It is more appropriate for representatives of the agricultural equipment industry to direct their assistance towards the secondary level, post-secondary level, or university level education than elementary education.

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[1]Computed on the CDC 3600 computer of Michigan State University.

[2]Significant at the .05 level.

[3]Fifty item means and five cluster means X five independent variables.

2. When assisting outside the context of the educational systems of developing countries, it is more appropriate for the agricultural equipment industry to assist in the training of mechanics and governmental personnel working in agricultural mechanization than assisting in basic literacy education.
3. It is appropriate for the agricultural equipment industry to assist in agricultural mechanization education of engine powered equipment in developing countries. However, it is not appropriate for this industry to assist in animal powered agricultural mechanization education in these countries.
4. It is more appropriate for the agricultural equipment industry to provide software type educational aids, e.g., printed matter, charts, and films than educational hardware, e.g., projectors, tools, tractors, and farm equipment.
5. It is more appropriate for the agricultural equipment industry to conduct workshops and seminars for agricultural mechanization teachers than for agricultural mechanization students.
6. It is more appropriate for the agricultural equipment industry to provide instructional aids than scholarships or grants for the

agricultural mechanization education of developing countries.

7. There was a significant difference* in seven of the fifty items on the questionnaire when the mean scores were analyzed by nationalities of the respondents. This indicates very little disagreement among the respondents.
8. When the mean scores of the items were analyzed by occupations of respondents, six of the fifty items showed significant differences.* This indicates a high degree of agreement.
9. Little disagreement was found when the responses were analyzed by geographical location of the countries represented as only six items showed significantly different* scores.
10. When analyzed by four levels of economic development, based on gross national product per capita, only three items showed significantly different* scores. This again indicates a high degree of agreement.
11. The final analyses, according to four levels of educational development, showed a high level of agreement as only two items had significantly different* scores.

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*Significant at the .05 level.

Conclusions and Implications

The following conclusions and implications are drawn regarding the appropriate role of the agricultural equipment industry in agricultural mechanization education in developing countries.

1. It is most appropriate for the agricultural equipment industry to place a high priority on the development of instructional aids for the schools of developing countries. These aids should consist of printed material, wall charts, film strips, and motion films pertaining to the area of engine powered agricultural machinery and should be directed towards the secondary, post-secondary, and university level students. It is less appropriate for the agricultural equipment industry to provide the schools with projectors, tools and shop equipment.

2. It is not appropriate for the agricultural equipment industry to become involved in elementary education or literacy training in these developing countries. Until these countries have developed a sizeable cadre of literate youth, it does not appear logical for the agricultural equipment industry to become greatly involved in agricultural mechanization education. However, from the international experience of the author and review of literature, it appears that most of these countries have developed a sizeable population of literate youth and are ready for greater vocational and technical education in which the agricultural equipment industry can be of considerable assistance.

Although the respondents did not perceive it appropriate for the agricultural equipment industry to become involved in elementary education, it may be proper to give this further consideration as many attitudes about agricultural mechanization are formed during these early years.

3. It is appropriate for the agricultural equipment industry to conduct workshops and seminars on agricultural mechanization education but these should be directed towards governmental agricultural mechanization specialists of the developing countries and the agricultural mechanization instructors rather than the students of the schools. This relates to the first conclusion, development of instructional aids, in that after the agricultural equipment industry has developed a series of instructional aids, it will be essential to have some formal method of introducing these to the instructors. This can be implemented through workshops and seminars where the instructors can be informed of the availability, value and correct use of these aids.

Many of the schools in developing countries have extended vacations during the year and, with proper planning, it should be possible for the agricultural equipment industry, with the cooperation of the educational systems, to schedule agricultural mechanization workshops or seminars for the instructors of these schools. The instructional aids which have been developed by the agricultural equipment industry could be used in these workshops to teach the instructors and, at the end

of the workshop, each instructor could be supplied with a similar kit to take back to his school.

4. The agricultural equipment industry can make educational contributions outside the context of the educational systems of developing countries. However, these should be directed towards the training of mechancis or in-service education of governmental personnel rather than the development of literacy training programs. The author is familiar with a program in Nigeria where several of the major agricultural equipment companies cooperate in an annual agricultural field day by demonstrating and explaining their new and modified equipment to government agricultural officers. Many of these officers are located in remote areas and have limited opportunities to keep abreast of new agricultural equipment developments. Such activities appear to make a major contribution in agricultural development and need to be extended to other countries.

Throughout this study, the respondents have indicated that the agricultural equipment industry should not deviate far from educational programs that have very direct application to engine powered agricultural mechanization. This is the area in which they are specialists and can make the greatest contribution.

5. There was a high level of agreement among the scores when analyzed by nationality and occupation of

the respondents and by geographical location, levels of economic development, and levels of educational development of the countries. This information appears to be very important as it indicates that the agricultural equipment industry does not need to develop separate educational programs for individual developing countries. A broad overall educational program may be designated for all developing countries with limited modifications for individual countries. The language may need to be translated and different special machines covered to fit the crops of a particular country but it does not appear necessary to emphasize financial aids in one area of the world, instructional aids in another, and the development of a program of workshops and seminars in a third part of the world. As instructional aids ranked high in all parts of the world, the agricultural equipment industry can develop a series of these and, with little adaptation, utilize them in educational programs in many countries. This continuity should make the development of educational programs more inviting to the industry.

Recommendations for Further Study

1. Numerous studies have been conducted on how students learn and the development of learning theories in more developed countries but little research has been conducted to determine if the same principles and theories apply in developing countries. The entry behavior of a

student from a developing country may be much different and educational practices accepted in the United States may not be appropriate in developing countries. Research needs to be conducted in this broad field to substantiate these practices.

2. As agricultural mechanization educational programs are developed, they need to be submitted to experimental trials in the field to determine if they are suited to the conditions within the specific country. Individualized instruction has proven to be very satisfactory under certain conditions in the more developed countries but it is not known if it is appropriate for the developing societies.

3. One point which was brought out several times in the study was the lack of adequate communication channels between the teachers in the schools and representatives of the agricultural equipment industry in the developing countries. Research should be conducted in these countries to improve this communication. Although this study has shown that workshops and seminars are appropriate methods of conducting this communication, the final plans must be developed within the individual countries.

4. As this study did not attempt to identify the types of agricultural machines used or needed in the individual countries, research should be conducted in

this area to identify the specific types of educational aids needed. This will vary with the crops grown and the intensity of the agriculture. Instructional charts on large diesel tractors and wheat combines may be desirable in Ethiopia whereas instructional aids on small two-wheeled rice paddy tractors may be more appropriate for parts of Pakistan. This type of study is needed in each individual country.

5. There is need for a detailed study to identify the various instructional assistance programs the agricultural equipment industry is conducting in developing countries. Some of these should be selected for evaluation to identify strong and weak points in their operation. This would facilitate the planning of additional programs.

6. A study to identify the instructional aids available from the agricultural equipment industry needs to be conducted. This should involve agricultural equipment firms throughout the world. This information should then be developed into a catalogue stating the type of aid, languages in which it is printed, educational level to which it is directed, costs, and address from which it is available. This catalogue should then be produced in several languages and distributed to agricultural mechanization teachers throughout the developing countries. This might best be handled through the Food and Agriculture Division of the United Nations.

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APPENDICES

APPENDIX A

SAMPLE INSTRUMENT WITH RESPONSE FREQUENCIES INSERTED

Sample Instrument with Response Frequencies Inserted*

SURVEY OF THE ROLE OF THE AGRICULTURAL EQUIPMENT INDUSTRY IN AGRICULTURAL MECHANIZATION EDUCATION IN DEVELOPING COUNTRIES

INTRODUCTION

Instructions: Please supply the following information about yourself, your current position, and international experience.

Col.

1. Name: _____ (1-3)

2. Current position or title: _____ (4)

3. Total months spent working in developing countries since July 1, 1959: _____ (5)

4. Developing country in which you have had the most experience in international agricultural mechanization education in the past 10 years: _____ (6-7)

PLEASE USE THIS COUNTRY AS THE FOCAL POINT IN GUIDING YOUR RESPONSES TO THE FOLLOWING QUESTIONS

5. Dates within that country: _____ (9)
to _____ (10)

Definition of terms:

Agricultural Mechanization: Unless stated otherwise, includes the use of hand tools and equipment, animal powered equipment, and engine powered equipment for the production, transportation, storage, and processing of agricultural goods.

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*Responses will not always total 86 due to some missing data.

Appropriate: Refers to how fitting or suitable you believe it is for the agricultural equipment industry to engage in a particular level of education or educational activity after considering the political, economic, social, educational, and agricultural development of the developing country under consideration.

Educational Levels: Refers to the various stages of formal or informal education from basic literacy upward.

Elementary Education: Education for the grades one through eight.

Secondary Education: Education for the grades nine through twelve.

Part I

Instructions: There are several educational levels to which the agricultural equipment industry may direct their assistance in the agricultural mechanization education for developing countries. Please read each of the following items and check (✓) the extent to which you believe it would be appropriate for the agricultural equipment industry to engage in that level of education. Please use the following five point scale

Very appropriate - - - - - 5

Appropriate - - - - - - - 4

Undediced - - - - - - - - 3

Inappropriate - - - - - - 2

Very inappropriate - - - - 1

A. One possibility is for the agricultural equipment industry to provide educational assistance at various levels within the established educational system of the developing country. Please indicate your response to this in the following questions.

	5	4	3	2	1	
6. Assist in basic literacy education of elementary level students	15	15	10	28	18	(11)
7. Assist in agricultural mechanization education in elementary schools in the use and care of:						
a) animal powered agricultural equipment	11	24	13	24	14	(12)
b) engine powered agricultural equipment	18	29	7	22	9	(13)
8. Assist in agricultural mechanization education in the secondary schools in the use and care of:						
a) animal powered agricultural equipment	14	31	11	20	9	(14)
b) engine powered agricultural equipment	37	34	4	6	4	(15)
9. Assist in agricultural mechanization education in post-secondary, but non-university schools (e.g. agricultural schools, trade schools, and technical schools) in the use and care of:						
a) animal powered agricultural equipment	26	21	12	21	11	(16)
b) engine powered agricultural equipment	67	16	1	1	1	(17)
10. Assist in agricultural mechanization education in the university level for the:						
a) animal powered agricultural equipment	20	20	12	21	11	(18)
b) engine powered agricultural equipment	61	16	2	5	2	(19)
						(20)

B. Another possibility is for the agricultural equipment industry to provide educational assistance at various levels outside the established educational system of the developing country. Please indicate your response to this in the following questions.

	5	4	3	2	1	
11. Assist in village level basis literacy of:						
a) out-of-school youth	24	15	8	18	20	(21)
b) adults	23	17	6	21	18	(22)
12. Assist in village level animal powered agricultural mechanization education for:						
a) out-of-school youth	13	26	16	19	10	(23)
b) adults	13	32	12	16	11	(24)
13. Assist in village level engine powered agricultural mechanization education for:						
a) out-of-school youth	36	31	8	6	5	(25)
b) adults	34	34	4	10	4	(26)
14. Assist in in-service agricultural mechanization education for governmental personnel working in agricultural mechanization	58	23	2	3	0	(27)
15. Assist in training of mechanics. (Not limited to employee of the agency conducting the educational service.)						
a) pre-employment training	49	25	7	3	1	(28)
b) in-service training	62	22	1	1	0	(29)
						(30)

Part II

Instructions: The following educational activities are contributions that might be made within the educational system of the developing country by the agricultural equipment industry. These are divided into three sub-headings of instructional aids, workshops and seminars, and financial assistance. Please check (✓) each of these as to the extent to which you believe it would be appropriate for the agricultural equipment industry to make that contribution. Please note that you are not asked to evaluate the activities, but to indicate the extent to which you believe it is appropriate for the

industry to make that contribution. Please use the following five point scale.

Very appropriate - - - - 5

Appropriate - - - - - - - 4

Undecided - - - - - - - - 3

Inappropriate - - - - - 2

Very inappropriate - - - 1

A. One possibility is for the agricultural equipment industry to provide educational aids to the schools. Please indicate your response to this in the following questions.

	5	4	3	2	1	
16. Provide teachers with detailed wall charts concerning the construction, operation, and maintenance of agricultural equipment	46	31	3	3	1	(31)
17. Provide printed materials on the operation, maintenance, and repair of agricultural equipment	48	31	1	2	3	(32)
18. Provide schools with filmstrips/slides on the operation, maintenance, and repair of agricultural equipment	46	28	7	2	2	(33)
19. Provide schools with educational films on the operation, maintenance, and repair of agricultural equipment	45	29	6	4	1	(34)
20. Provide schools with audio-visual hardware such as motion picture projectors, overhead projectors, or slide projectors	28	31	14	9	3	(35)

	5	4	3	2	1	
21. Provide schools with shop tools and equipment	33	26	17	5	3	(36)
22. Provide schools with tractor assemblies, such as engines, transmissions, and differentials, to be used for teaching purposes	39	36	6	3	1	(37)
23. Provide schools with complete cut-away or sectioned tractors to be used for teaching purposes	41	28	8	6	2	(38)
24. Loan tractors and other farm equipment to schools	24	34	12	10	5	(39)
						(40)

B. A second possibility is for the agricultural equipment industry to conduct workshops or seminars on agricultural mechanization. Please indicate your response to this.

	5	4	3	2	1	
25. Conduct workshops for students, on subjects such as hydraulic systems or new equipment, with a length of:						
a) one to five days	18	30	18	11	6	(41)
b) more than five days	15	19	30	14	5	(42)
26. Conduct workshops for in-service education of agricultural mechanization teachers, on subjects such as hydraulic systems or new equipment, with a length of:						
a) one to five days	23	37	14	9	1	(43)
b) more than five days	41	23	11	5	3	(44)

	5	4	3	2	1	
27. Conduct workshops for elementary school teachers, to inform them of the value of agricultural mechanization, with the length of:						
a) one to five days	22	32	9	16	5	(45)
b) more than five days	12	18	20	22	11	(46)
28. Provide complete agricultural mechanization training for some agricultural mechanization teachers for the public schools	33	29	8	14	2	(47)
29. Provide representatives to serve on advisory committees for:						
a) conduct manpower needs surveys	22	20	25	15	4	(48)
b) evaluate and develop agricultural mechanization curricula	32	32	12	8	1	(49)
						(50)

C. A third possibility is for the agricultural equipment industry to provide financial assistance in the form of scholarships and grants. Please indicate your response to this.

	5	4	3	2	1	
30. Provide scholarships for students to attend non-degree agricultural mechanization training centers:						
a) within their home country	37	31	6	7	3	(51)
b) outside their home country	23	23	14	17	7	(52)

	5	4	3	2	1	
31. Provide scholarships for university students to obtain a degree in agricultural engineering or agricultural mechanization:						
a) within their home country	31	18	12	13	8	(53)
b) outside their home country	36	22	13	8	6	(54)
32. Provide scholarships for advanced university degree in agricultural engineering or agricultural mechanization:						
a) within their home country	16	16	15	22	13	(55)
b) outside their home country	38	22	12	8	5	(56)
33. Provide scholarships for teachers of agricultural mechanization to receive advanced training:						
a) within their home country	25	31	11	9	7	(57)
b) outside their home country	38	30	7	4	6	(58)
34. Assist agricultural mechanization education by making grants to schools to allow them to:						
a) establish agricultural mechanization education	39	21	10	10	3	(59)
b) expand agricultural mechanization education	40	26	9	7	4	(60)
						(61)

	5	4	3	2	1	
35. Provide funds for United States education personnel to serve in advisory capacities on agricultural mechanization in developing countries for:						
a) six months or less	28	24	10	15	4	(62)
b) more than six months	34	23	13	8	6	(63)
36. Provide funds for United States education personnel to assist in the agricultural mechanization education by teaching in developing countries for:						
a) six months or less	6	15	16	30	13	(64)
b) more than six months	36	23	13	5	4	(65)

37. In your opinion, to what extent should the agricultural equipment industry cooperate with other companies and agencies for the establishment of a fund within some international agency such as FAO to develop teaching aids and other agricultural mechanization educational services?

38. Please feel free to make additional comments.

RMS/kd

APPENDIX B

COVER LETTER TO UNITED STATES EDUCATORS

Dear Dr. _____:

I am conducting a study concerning the educational activities that the agricultural equipment industry might contribute towards agricultural mechanization in developing countries. In order to obtain further information on this, I am asking the cooperation of representatives of the agricultural equipment industry, agricultural engineers and mechanization specialists from developing countries, and U. S. university agricultural engineers who have worked in developing countries.

Dr. _____, Chairman of your Department, has been kind enough to provide me with your name as an agricultural engineer who has worked in a developing country within the past ten years. I would certainly appreciate it if you would complete the enclosed questionnaire and return it to me in the enclosed self-addressed and stamped envelope.

If this study can be carried through as planned, I believe it will contribute to the efficiency of professional educators and industrial representatives as we work together towards the agricultural advancement of developing countries.

I sincerely appreciate your cooperation in this study.

Sincerely,

Robert M. Schneider
Assistant Instructor

RMS/cs

APPENDIX C

COVER LETTER TO OVERSEAS PERSONNEL

Dear Mr. _____:

I am conducting a study concerning the educational activities that the agricultural equipment industry might contribute towards agricultural mechanization in developing countries. In order to obtain further information on this, I am seeking the cooperation of representatives of the agricultural equipment industry, U. S. agricultural engineers who have worked in developing countries, and agricultural engineers and mechanization specialists from developing countries.

Professor C. J. Mackson, Specialist in Agricultural Mechanization, Agricultural Engineering Department, Michigan State University, has been kind enough to provide me with your name as an individual very directly involved in agricultural mechanization in a developing country. I would certainly appreciate it if you would complete the enclosed questionnaire and return it to me in the enclosed self-addressed envelope.

If this study can be carried through as planned, I believe it will contribute to the efficiency of professional educators and industrial representatives as we work together towards the agricultural advancement of developing countries.

We plan to publish a summary of this study. If you are interested in receiving a reprint of this article, please indicate this on the questionnaire.

I sincerely appreciate your cooperation in this study.

Cordially,

Robert M. Schneider
Assistant Instructor

RMS/cs

Enclosure

APPENDIX D

COVER LETTER TO CHAIRMEN OF UNITED STATES AGRICULTURAL ENGINEERING DEPARTMENTS

Dear Dr. _____:

I am conducting a doctoral study concerning the educational activities that the U. S. agricultural machinery industry might contribute towards agricultural mechanization in developing countries. To do this, I wish to contact representatives of agricultural mechanization and engineering education and request their cooperation by answering a questionnaire which I have developed.

In order to obtain a list of agricultural mechanization and engineering educators who have had international experience, I am contacting each of the ECPD accredited institutions and asking your cooperation. I would sincerely appreciate it if you would supply me with the following:

a) A list of the names and addresses of members of your staff who have devoted at least one year out of the past ten years to working as agricultural mechanization or engineering educators in developing countries.

b) A listing of the country in which each of these men has had the majority of his experience.

After this list has been compiled, I will select some of these men to be included in my study and will mail them a questionnaire.

Your cooperation will certainly be appreciated. A self-addressed and stamped envelope is enclosed for your convenience.

Sincerely,

Robert M. Schneider
Assistant Instructor

RMS/cs

APPENDIX E

STATISTICAL TABLES

TABLE 11.--Mean scores, standard deviations, and levels of significance for questions in Cluster I which pertain to educational assistance at various levels within the established educational systems of developing countries as perceived by the total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
6	$\bar{X}$	2.78	2.53	3.02	2.66	2.10	3.44	2.63	2.72	2.83	2.55	2.86	3.04	3.30	3.08	2.88	2.96	2.80
	sd	1.42	1.35	1.46	1.40	1.37	1.34	1.50	1.37	1.38	1.28	1.58	1.15	1.83	1.50	1.39	1.37	1.52
	F/sig		2.60 / 0.11		1.31 / 0.26			1.29 / 0.28				0.77 / 0.51				0.10 / 0.96		
7a	$\bar{X}$	2.93	2.91	2.95	3.04	2.80	3.00	3.21	2.88	2.78	3.70	2.32	2.88	2.90	4.08	2.75	2.96	2.40
	sd	1.32	1.21	1.43	1.20	1.55	1.19	1.51	1.45	1.11	1.38	1.25	1.11	1.37	1.16	1.39	1.26	1.06
	F/sig		0.03 / 0.87		0.30 / 0.58			0.37 / 0.78				4.27 / 0.008				4.45 / 0.01		
7b	$\bar{X}$	3.26	3.21	3.30	3.11	3.10	3.89	2.84	3.00	3.67	2.80	3.18	3.46	4.10	3.08	3.17	3.48	3.27
	sd	1.38	1.41	1.37	1.32	1.73	1.08	1.46	1.41	1.19	1.24	1.59	1.27	0.99	1.31	1.46	1.37	1.28
	F/sig		0.10 / 0.76		0.00 / 0.98			2.89 / 0.04				2.32 / 0.08				0.33 / 0.80		
8a	$\bar{X}$	3.21	3.12	3.30	3.32	2.10	3.17	3.37	3.48	3.06	3.15	3.45	3.31	2.90	3.50	3.33	3.30	3.07
	sd	1.32	1.29	1.25	1.22	1.52	1.42	1.38	1.26	1.26	1.27	1.30	1.32	1.52	1.31	1.40	1.30	1.33
	F/sig		0.42 / 0.52		7.44 / 0.01			0.43 / 0.73				0.46 / 0.71				0.24 / 0.86		
8b	$\bar{X}$	4.06	4.02	4.09	3.95	3.60	4.61	4.05	4.08	4.00	4.00	4.14	4.15	4.60	4.25	4.17	4.30	3.93
	sd	1.17	1.06	1.29	1.14	1.84	0.61	1.13	1.04	1.28	1.03	1.17	1.16	0.52	0.96	1.01	1.03	1.33
	F/sig		0.08 / 0.78		0.62 / 0.44			1.37 / 0.26				0.72 / 0.54				0.38 / 0.76		
9a	$\bar{X}$	3.41	3.40	3.42	3.54	2.50	3.28	3.53	3.48	3.44	3.10	3.54	3.73	2.80	3.67	3.21	3.59	3.33
	sd	1.42	1.40	1.47	1.39	1.90	1.45	1.50	1.42	1.38	1.52	1.26	1.43	1.32	1.30	1.47	1.45	1.40
	F/sig		0.01 / 0.94		4.01 / 0.05			0.10 / 0.96				1.49 / 0.22				0.44 / 0.72		
9b	$\bar{X}$	4.71	4.67	4.74	4.68	4.50	4.83	4.63	4.72	4.89	4.65	4.64	4.85	5.00	4.58	4.71	4.85	4.80
	sd	0.67	0.81	0.49	0.64	1.27	0.38	0.60	0.68	0.32	0.59	0.73	0.37	0.00	0.67	0.69	0.36	0.41
	F/sig		0.23 / 0.63		0.44 / 0.51			0.87 / 0.46				1.58 / 0.20				0.78 / 0.51		
10a	$\bar{X}$	3.13	3.21	3.05	3.23	2.40	3.33	3.26	3.20	2.72	2.90	3.32	3.58	2.20	3.17	3.08	3.41	2.93
	sd	1.46	1.37	1.56	1.44	1.78	1.41	1.48	1.41	1.60	1.41	1.32	1.60	1.03	1.27	1.44	1.47	1.67
	F/sig		0.26 / 0.61		2.45 / 0.12			0.64 / 0.59				2.60 / 0.06				0.39 / 0.76		
10b	$\bar{X}$	4.50	4.49	4.51	4.57	4.20	4.83	4.58	4.44	4.50	4.60	4.59	4.69	4.60	4.42	4.67	4.78	4.60
	sd	0.97	0.94	1.01	0.76	1.32	0.38	0.84	1.12	0.86	0.82	0.91	0.68	0.70	0.90	0.87	0.51	0.63
	F/sig		0.01 / 0.91		1.42 / 0.24			0.77 / 0.51				0.09 / 0.97				0.73 / 0.54		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.

TABLE 12.--Mean scores, standard deviations, and levels of significance for questions in Cluster II which pertain to educational assistance outside the established educational systems of developing countries as perceived by the total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
11a	$\bar{X}$	3.02	2.63	3.42	2.82	2.30	3.56	2.84	3.16	3.06	3.00	2.91	3.38	3.50	3.58	3.12	3.11	3.13
	sd	1.60	1.50	1.62	1.54	1.49	1.62	1.50	1.54	1.73	1.49	1.66	1.55	1.78	1.50	1.51	1.62	1.77
	F/sig		5.52 / 0.02		0.93 / 0.34			0.64 / 0.59				0.57 / 0.64				0.28 / 0.84		
11b	$\bar{X}$	3.03	2.77	3.30	2.86	2.20	3.44	2.89	3.40	2.83	2.85	3.36	3.27	3.20	3.33	3.54	2.96	3.00
	sd	1.58	1.51	1.61	1.49	1.32	1.62	1.41	1.63	1.54	1.31	1.81	1.54	1.55	1.50	1.53	1.56	1.65
	F/sig		2.52 / 0.12		1.68 / 0.20			0.84 / 0.47				0.42 / 0.74				0.70 / 0.55		
12a	$\bar{X}$	3.08	3.09	3.07	3.20	2.20	3.00	3.37	3.20	3.00	3.35	2.95	3.23	2.90	3.67	3.04	3.30	2.73
	sd	1.35	1.29	1.42	1.27	1.32	1.46	1.34	1.26	1.50	1.22	1.40	1.45	1.52	1.23	1.43	1.32	1.44
	F/sig		0.01 / 0.94		5.04 / 0.03			0.31 / 0.82				0.42 / 0.74				1.19 / 0.32		
12b	$\bar{X}$	3.16	3.19	3.14	3.25	2.40	2.89	3.37	3.56	2.94	3.45	3.18	3.23	2.80	3.67	3.38	3.15	2.87
	sd	1.37	1.30	1.46	1.31	1.58	1.37	1.42	1.29	1.43	1.32	1.50	1.39	1.40	1.37	1.53	1.23	1.46
	F/sig		0.02 / 0.88		3.17 / 0.08			1.18 / 0.32				0.48 / 0.70				0.85 / 0.47		
13a	$\bar{X}$	4.01	3.79	4.23	3.84	3.50	4.28	3.89	3.88	4.33	3.65	4.09	4.23	4.60	3.67	4.21	3.92	4.47
	sd	1.15	1.26	1.00	1.20	1.27	1.18	1.10	1.20	1.03	1.31	1.23	0.99	0.70	1.30	1.02	1.38	0.52
	F/sig		3.24 / 0.08		0.64 / 0.43			0.91 / 0.44				1.84 / 0.15				1.37 / 0.26		
13b	$\bar{X}$	3.98	3.91	4.05	3.89	3.60	4.11	3.79	4.04	4.17	3.60	4.18	4.08	4.50	3.33	4.25	3.89	4.47
	sd	1.16	1.23	1.09	1.24	1.17	1.28	1.36	1.06	0.92	1.31	1.26	1.06	0.53	1.50	1.03	1.25	0.52
	F/sig		0.31 / 0.58		0.44 / 0.51			0.38 / 0.76				1.65 / 0.18				2.74 / 0.05		
14	$\bar{X}$	4.58	4.63	4.53	4.57	4.70	4.78	4.68	4.36	4.67	4.65	4.41	4.54	5.00	4.75	4.46	4.63	4.67
	sd	0.71	0.62	0.80	0.66	0.48	0.55	0.48	1.04	0.48	0.49	0.96	0.76	0.00	0.45	0.93	0.56	0.82
	F/sig		0.36 / 0.55		0.35 / 0.56			1.44 / 0.24				1.64 / 0.19				0.52 / 0.67		
15a	$\bar{X}$	4.34	4.46	4.21	4.43	3.80	3.83	4.58	4.52	4.50	4.55	4.41	4.08	4.70	4.50	4.33	4.18	4.73
	sd	0.99	0.83	1.12	0.76	1.81	1.42	0.69	0.77	0.51	0.69	0.96	1.16	0.48	0.80	1.24	0.88	0.46
	F/sig		1.44 / 0.23		3.11 / 0.08			2.82 / 0.04				1.54 / 0.21				1.18 / 0.32		
15b	$\bar{X}$	4.69	4.77	4.60	4.64	4.80	4.67	4.89	4.56	4.72	4.85	4.59	4.62	4.90	4.83	4.58	4.74	4.73
	sd	0.56	0.57	0.54	0.65	0.42	0.48	0.46	0.71	0.46	0.49	0.73	0.50	0.32	0.58	0.72	0.45	0.46
	F/sig		1.84 / 0.18		0.57 / 0.45			1.33 / 0.27				1.39 / 0.25				0.63 / 0.60		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.

TABLE 13.--Mean scores, standard deviations, and levels of significance for questions in Cluster III which pertain to providing instructional aids to schools as perceived by the total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
16	$\bar{X}$	4.30	4.49	4.12	4.18	4.20	4.39	4.26	4.28	4.22	4.25	4.32	4.08	4.70	4.17	4.33	4.41	4.07
	sd	1.05	0.83	1.22	1.17	1.55	0.92	1.15	1.02	1.31	1.12	1.04	1.26	0.48	1.40	1.05	0.89	1.28
	F/sig		2.74 / 0.10		0.00 / 0.97			0.08 / 0.97				0.80 / 0.50				0.37 / 0.78		
17	$\bar{X}$	4.35	4.44	4.26	4.20	4.20	4.56	4.16	4.20	4.50	4.20	4.36	4.31	4.60	4.00	4.42	4.56	4.07
	sd	1.03	0.91	1.14	1.02	1.55	0.98	1.30	1.19	0.51	1.28	1.05	1.09	0.52	1.60	1.02	0.85	0.96
	F/sig		0.71 / 0.40		0.00 / 0.99			0.72 / 0.54				0.32 / 0.81				1.15 / 0.33		
18	$\bar{X}$	4.29	4.30	4.28	4.14	4.10	4.44	4.05	4.28	4.39	4.20	4.18	4.38	4.50	3.92	4.20	4.44	4.40
	sd	1.02	0.99	1.05	1.02	1.73	0.70	1.51	0.98	0.61	1.40	1.10	0.70	0.53	1.73	1.10	0.70	0.51
	F/sig		0.01 / 0.92		0.01 / 0.93			0.54 / 0.66				0.35 / 0.79				0.85 / 0.47		
19	$\bar{X}$	4.28	4.16	4.40	4.11	4.10	4.61	4.00	4.20	4.22	3.95	4.27	4.50	4.20	3.67	4.29	4.41	4.33
	sd	1.00	1.04	0.95	0.99	1.60	0.50	1.49	1.08	0.65	1.47	1.08	0.58	0.63	1.77	1.08	0.69	0.49
	F/sig		1.16 / 0.28		0.00 / 0.97			1.15 / 0.33				1.10 / 0.35				1.56 / 0.21		
20	$\bar{X}$	3.80	3.56	4.05	3.57	3.40	4.00	3.53	4.04	3.78	3.45	4.09	3.92	3.90	3.33	4.08	3.67	4.13
	sd	1.18	1.14	1.17	1.13	1.78	1.08	1.47	1.14	0.81	1.50	1.02	1.02	0.88	1.61	1.02	1.20	0.64
	F/sig		3.83 / 0.05		0.14 / 0.71			0.85 / 0.47				1.17 / 0.33				1.69 / 0.18		
21	$\bar{X}$	3.87	3.72	4.02	3.86	3.10	3.94	3.89	4.04	3.78	3.65	4.14	3.81	4.10	3.92	4.17	3.52	4.20
	sd	1.23	1.10	1.34	1.17	1.79	1.21	1.24	1.06	1.40	1.35	0.83	1.33	1.29	1.31	0.87	1.28	1.37
	F/sig		1.31 / 0.26		2.80 / 0.10			0.17 / 0.92				0.71 / 0.55				1.63 / 0.19		
22	$\bar{X}$	4.23	4.19	4.28	4.18	3.80	4.17	4.00	4.44	4.39	4.15	4.18	4.35	4.30	3.83	4.25	4.18	4.73
	sd	0.95	0.82	1.08	0.92	1.62	1.04	1.20	0.77	0.78	1.18	0.80	0.89	1.06	1.40	0.79	1.00	0.46
	F/sig		0.20 / 0.65		1.03 / 0.32			0.94 / 0.43				0.20 / 0.90				2.16 / 0.10		
23	$\bar{X}$	4.13	3.88	4.37	4.02	3.30	4.17	3.74	4.40	4.28	4.05	4.00	4.35	4.10	4.00	4.04	4.00	4.73
	sd	1.01	1.12	1.07	1.09	1.77	1.10	1.48	0.87	0.96	1.28	1.15	0.94	1.29	1.41	1.16	1.18	0.46
	F/sig		4.29 / 0.04		2.80 / 0.10			1.38 / 0.26				0.44 / 0.72				1.68 / 0.18		
24	$\bar{X}$	3.69	3.77	3.60	3.73	3.70	3.50	3.68	3.80	3.78	3.35	3.91	3.81	3.40	3.33	3.75	3.48	4.20
	sd	1.23	1.15	1.31	1.19	1.57	1.10	1.42	1.29	1.16	1.50	1.06	1.06	1.43	1.67	1.11	1.19	1.08
	F/sig		0.37 / 0.54		0.00 / 0.95			0.23 / 0.88				0.99 / 0.40				1.47 / 0.23		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.

TABLE 14.--Mean scores, standard deviations, and levels of significance for questions in Cluster IV which pertain to conducting workshops or seminars on agricultural mechanization as perceived by total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
25a	$\bar{X}$	3.40	3.46	3.32	3.41	3.10	3.33	2.89	3.44	3.94	2.90	3.50	3.38	4.10	3.00	3.25	3.44	3.73
	sd	1.33	1.28	1.39	1.28	1.52	1.68	1.45	1.12	1.00	1.41	1.01	1.50	1.29	1.81	1.19	1.34	1.22
	F/sig		0.23 / 0.63		0.44 / 0.51			1.96 / 0.13				1.91 / 0.14				0.75 / 0.53		
25b	$\bar{X}$	3.19	3.07	3.30	3.14	2.90	3.22	3.10	3.52	2.94	3.10	3.32	3.19	3.20	2.92	3.42	3.00	3.47
	sd	1.27	1.22	1.32	1.19	1.45	1.48	1.29	1.08	1.21	1.25	1.25	1.33	1.23	1.38	0.93	1.24	1.60
	F/sig		0.72 / 0.40		0.30 / 0.59			0.82 / 0.49				0.10 / 0.96				0.89 / 0.45		
26a	$\bar{X}$	3.77	3.81	3.72	3.68	3.80	3.56	3.58	4.00	3.78	3.60	3.82	3.58	4.20	3.58	3.75	3.59	4.07
	sd	1.13	0.96	1.30	1.12	1.40	1.54	1.39	0.96	0.73	1.31	1.01	1.33	0.79	1.56	1.22	1.12	0.88
	F/sig		0.14 / 0.71		0.08 / 0.77			0.67 / 0.57				0.79 / 0.50				0.58 / 0.63		
26b	$\bar{X}$	3.99	4.00	3.98	3.95	3.50	4.11	3.95	4.16	4.06	4.00	4.09	3.96	4.40	3.75	4.33	4.04	4.00
	sd	1.32	1.21	1.42	1.22	1.58	1.49	1.22	1.07	1.35	1.21	1.27	1.48	0.70	1.29	0.82	1.40	1.56
	F/sig		0.01 / 0.94		1.01 / 0.32			0.11 / 0.96				0.30 / 0.82				0.62 / 0.60		
27a	$\bar{X}$	3.51	3.33	3.70	3.34	3.10	3.50	3.67	3.68	3.67	3.50	3.36	3.42	4.30	4.08	3.25	3.33	3.93
	sd	1.33	1.34	1.32	1.26	1.60	1.65	1.38	1.25	1.19	1.32	1.33	1.47	1.06	1.08	1.45	1.47	1.03
	F/sig		1.68 / 0.20		0.27 / 0.60			0.24 / 0.87				1.26 / 0.30				1.68 / 0.18		
27b	$\bar{X}$	2.87	2.65	3.09	2.66	2.80	3.11	2.63	3.00	2.83	2.80	2.91	2.81	3.00	2.83	3.00	2.81	2.87
	sd	1.36	1.19	1.49	1.40	1.23	1.41	1.46	1.41	1.34	1.44	1.54	1.33	1.25	1.53	1.35	1.33	1.55
	F/sig		2.30 / 0.13		0.09 / 0.77			0.42 / 0.74				0.06 / 0.98				0.08 / 0.97		
28	$\bar{X}$	3.90	3.67	4.12	3.73	3.70	4.28	3.79	3.92	3.78	3.95	3.86	3.92	4.20	4.42	4.04	3.63	4.00
	sd	1.16	1.25	1.03	1.23	1.25	1.02	1.13	1.29	1.11	1.19	1.32	1.13	0.92	0.67	1.16	1.30	1.13
	F/sig		3.21 / 0.08		0.00 / 0.95			0.74 / 0.53				0.19 / 0.90				1.41 / 0.25		
29a	$\bar{X}$	3.48	3.21	3.74	3.41	3.20	3.83	3.16	3.52	3.67	3.40	3.41	3.50	4.30	3.75	3.33	3.51	3.80
	sd	1.18	1.21	1.11	1.26	0.63	1.25	1.42	1.04	1.03	1.23	1.30	1.17	0.82	1.36	1.20	1.16	1.21
	F/sig		4.56 / 0.04		0.26 / 0.62			1.09 / 0.36				1.55 / 0.21				0.58 / 0.63		
29b	$\bar{X}$	3.96	3.98	3.95	3.89	4.10	4.06	3.74	4.08	4.11	4.00	4.00	3.73	4.80	4.00	3.83	4.07	4.13
	sd	1.09	1.01	1.17	1.12	0.99	1.16	1.24	0.86	1.23	1.08	1.15	1.18	0.42	0.95	1.09	1.11	1.36
	F/sig		0.01 / 0.92		0.30 / 0.58			0.47 / 0.70				2.35 / 0.08				0.28 / 0.84		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.

TABLE 15.--Mean scores, standard deviations, and levels of significance for questions in Cluster V which pertain to providing financial assistance in the form of scholarships and grants as perceived by total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
30a	$\bar{X}$	4.00	3.98	4.02	4.07	3.00	3.67	4.05	4.32	4.06	4.20	4.09	3.85	4.50	3.83	4.25	4.00	4.20
	sd	1.24	1.06	1.41	1.15	1.56	1.64	0.97	0.90	1.39	1.00	0.92	1.57	0.97	1.11	1.19	1.21	1.32
	F/sig		0.03 / 0.86		6.14 / 0.02			0.98 / 0.41				0.80 / 0.50				0.41 / 0.75		
30b	$\bar{X}$	3.37	3.23	3.51	3.30	3.20	3.78	3.16	3.44	3.28	3.40	3.23	3.38	3.80	3.50	3.42	3.22	3.60
	sd	1.40	1.49	1.30	1.49	1.40	1.44	1.42	1.32	1.49	1.35	1.48	1.47	1.40	1.51	1.41	1.31	1.64
	F/sig		0.86 / 0.36		0.03 / 0.85			0.66 / 0.58				0.37 / 0.78				0.25 / 0.86		
31a	$\bar{X}$	3.45	3.53	3.37	3.81	2.50	2.11	4.10	4.32	3.06	3.90	4.04	2.96	2.90	4.08	4.04	3.00	3.27
	sd	1.55	1.47	1.65	1.43	1.18	1.45	1.24	1.07	1.66	1.29	1.43	1.71	1.60	1.24	1.40	1.59	1.79
	F/sig		0.23 / 0.63		7.29 / 0.01			11.39/<0.0005				3.02 / 0.04				2.65 / 0.06		
31b	$\bar{X}$	3.82	3.70	3.95	3.82	3.10	4.28	3.47	4.00	3.89	3.75	3.82	4.23	3.70	3.92	3.92	3.78	4.20
	sd	1.32	1.39	1.25	1.42	1.37	1.32	1.39	0.96	1.53	1.25	1.18	1.18	1.95	1.24	1.14	1.53	1.26
	F/sig		0.80 / 0.37		2.11 / 0.15			1.26 / 0.30				0.73 / 0.54				0.33 / 0.81		
32a	$\bar{X}$	2.86	2.86	2.86	3.09	2.50	1.89	3.47	3.24	2.78	3.00	3.23	2.73	2.50	3.25	3.21	2.56	2.87
	sd	1.49	1.42	1.57	1.44	1.18	1.45	1.31	1.42	1.56	1.38	1.57	1.61	1.58	1.66	1.41	1.48	1.68
	F/sig		0.00 / 1.00		1.45 / 0.23			4.51 / 0.01				0.69 / 0.56				0.99 / 0.40		
32b	$\bar{X}$	3.90	3.58	4.21	3.82	3.70	4.28	3.89	3.88	3.94	3.95	3.73	4.42	3.90	3.92	4.12	4.00	4.00
	sd	1.29	1.28	1.24	1.22	1.06	1.27	0.94	1.39	1.43	1.19	1.39	0.90	1.60	1.31	1.03	1.30	1.46
	F/sig		5.33 / 0.02		0.08 / 0.78			0.40 / 0.75				1.41 / 0.25				0.08 / 0.97		
33a	$\bar{X}$	3.57	3.63	3.51	3.82	2.90	3.11	4.05	3.76	3.28	3.60	4.14	2.96	3.80	4.25	3.88	3.30	3.20
	sd	1.40	1.29	1.52	1.22	1.37	1.81	0.91	1.23	1.64	1.19	0.99	1.71	1.62	0.87	1.26	1.51	1.78
	F/sig		0.15 / 0.70		4.38 / 0.04			1.76 / 0.16				2.95 / 0.04				1.95 / 0.13		
33b	$\bar{X}$	4.01	3.86	4.16	3.93	3.80	3.83	3.95	4.36	4.17	4.10	4.09	4.12	4.10	4.00	4.25	3.96	4.20
	sd	1.24	1.21	1.27	1.15	1.32	1.69	1.22	0.95	0.86	1.02	1.51	1.18	1.10	1.21	1.15	1.40	1.01
	F/sig		1.28 / 0.26		0.10 / 0.75			0.81 / 0.49				0.00 / 1.00				0.29 / 0.83		
34a	$\bar{X}$	3.86	3.72	4.00	3.84	3.20	3.44	3.95	4.44	3.83	4.10	4.09	3.62	4.10	4.17	4.17	3.67	3.93
	sd	1.38	1.22	1.53	1.24	1.69	1.85	0.97	0.96	1.50	1.02	1.27	1.65	1.45	1.03	1.27	1.47	1.62
	F/sig		0.88 / 0.35		1.90 / 0.17			2.02 / 0.12				0.70 / 0.55				0.67 / 0.57		
34b	$\bar{X}$	4.06	3.81	4.30	4.09	3.60	4.00	3.79	4.40	4.28	3.80	4.45	4.04	4.20	3.75	4.38	4.04	4.20
	sd	1.15	1.16	1.10	1.03	1.17	1.28	1.27	0.87	1.02	1.28	0.67	1.18	1.32	1.42	0.82	1.16	1.21
	F/sig		4.00 / 0.05		1.76 / 0.19			1.29 / 0.28				1.28 / 0.29				0.92 / 0.44		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.

TABLE 16.--Mean scores, standard deviations, and levels of significance for questions 35 and 36 which pertain to providing funds for United States education personnel to work in developing countries as perceived by the total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
35a	$\bar{X}$	2.76	2.84	2.67	2.82	2.20	2.33	2.21	3.24	3.06	2.40	2.64	2.69	3.80	2.33	2.71	2.52	3.60
	sd	1.39	1.34	1.44	1.42	0.92	1.53	1.40	1.27	1.35	1.39	1.33	1.54	1.23	1.72	1.40	1.16	1.55
	F/sig		0.29 / 0.59		1.72 / 0.20			2.86 / 0.04				2.32 / 0.08				2.43 / 0.07		
35b	$\bar{X}$	3.77	3.67	3.86	3.68	3.50	4.06	3.47	4.24	3.44	3.90	4.09	3.73	3.60	3.50	4.17	3.96	3.40
	sd	1.38	1.30	1.46	1.47	1.08	1.30	1.74	0.97	1.46	1.59	1.23	1.46	1.35	1.83	1.13	1.28	1.59
	F/sig		0.39 / 0.53		0.13 / 0.72			1.81 / 0.15				0.38 / 0.77				1.24 / 0.30		
36a	$\bar{X}$	2.45	2.53	2.37	2.52	2.20	1.94	1.84	3.08	2.72	2.25	2.41	2.19	3.30	2.08	2.50	2.22	2.93
	sd	1.32	1.30	1.36	1.36	0.92	1.35	1.17	1.26	1.36	1.37	1.30	1.26	1.49	1.67	1.38	1.05	1.49
	F/sig		0.32 / 0.57		0.51 / 0.48			4.64 / 0.005				1.82 / 0.15				1.20 / 0.32		
36b	$\bar{X}$	4.02	3.67	4.37	3.82	4.00	4.33	3.79	4.12	4.11	4.20	3.86	4.15	4.20	3.83	3.96	4.30	4.07
	sd	1.22	1.34	0.98	1.33	1.05	0.91	1.62	1.09	1.13	1.36	1.32	0.92	1.40	1.70	1.23	0.91	1.28
	F/sig		7.61 / 0.01		0.16 / 0.69			0.64 / 0.59				0.36 / 0.78				0.52 / 0.67		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.

TABLE 17.--Mean scores, standard deviations, and levels of significance for means of Clusters I, II, III, IV, and V as perceived by the total respondents and sub-groups of respondents.

Question Number			Nationality		Occupation		Geographical Division				Economic Development				Educational Levels			
		Total Respondents	U. S.	Non-U. S.	Education	Industry	Med. and Middle East	Sub-Sahara Africa	South Asia	Central & S. America	Primitive	Traditional	Transi-tional	Industrial Revolution	Level I	Level II	Level III	Level IV
	n*	86	43	43	44	10	18	19	25	18	20	22	26	10	12	24	27	15
Cluster I	$\bar{X}$	3.58	3.51	3.64	3.59	3.19	3.91	3.55	3.55	3.58	3.48	3.56	3.83	3.60	3.76	3.62	3.72	3.50
	sd	0.73	0.78	0.68	0.68	1.24	0.56	0.76	0.70	0.57	0.76	0.68	0.55	0.64	0.69	0.66	0.74	0.53
	F/sig		0.76 / 0.38		1.99 / 0.16			1.31 / 0.28				1.24 / 0.30				0.48 / 0.70		
Cluster II	$\bar{X}$	3.81	3.70	3.92	3.77	3.43	3.94	3.81	3.85	3.90	3.77	3.79	3.99	4.00	3.92	3.95	3.76	4.00
	sd	0.74	0.79	0.68	0.68	0.94	0.86	0.52	0.81	0.61	0.62	0.90	0.64	0.65	0.68	0.77	0.80	0.44
	F/sig		1.97 / 0.16		1.69 / 0.20			0.12 / 0.95				0.58 / 0.63				0.47 / 0.70		
Cluster III	$\bar{X}$	4.12	4.06	4.18	4.02	3.77	4.20	3.93	4.19	4.20	3.92	4.17	4.20	4.20	3.80	4.18	4.07	4.38
	sd	0.79	0.66	0.91	0.70	1.54	0.70	1.12	0.74	0.51	1.12	0.72	0.65	0.51	1.35	0.72	0.67	0.41
	F/sig		0.47 / 0.50		0.65 / 0.42			0.53 / 0.66				0.58 / 0.63				1.27 / 0.29		
Cluster IV	$\bar{X}$	3.63	3.49	3.78	3.55	3.54	3.86	3.42	3.68	3.72	3.53	3.60	3.66	4.06	3.70	3.64	3.55	3.87
	sd	0.70	0.74	0.64	0.79	0.70	0.65	0.85	0.67	0.56	0.84	0.77	0.60	0.34	0.95	0.68	0.69	0.53
	F/sig		3.94 / 0.05		0.01 / 0.96			1.32 / 0.27				1.35 / 0.27				0.69 / 0.56		
Cluster V	$\bar{X}$	3.79	3.63	3.96	3.83	3.40	3.73	3.80	4.03	3.81	3.79	3.98	3.86	3.79	3.88	4.08	3.67	3.93
	sd	0.74	0.79	0.65	0.70	0.89	0.76	0.71	0.52	0.81	0.64	0.54	0.75	0.95	0.70	0.53	0.73	0.78
	F/sig		4.46 / 0.04		2.76 / 0.10			0.78 / 0.51				0.32 / 0.81				1.58 / 0.20		

*Less than stated n due to some respondents not answering all questions. N does not always total 86.