

analytical tools in price analysis, as well as the much-needed introduction to computer techniques. (in the one exercise involving use of the computer). The project becomes an integral part of the course, and, in general, the favorable reaction by students to this approach has been encouraging.

REFERENCES

(1) Wallace, James J., "Student Management of a Laboratory Farm," *Journal of Farm Economics*, 45:563-566, August 1963.

(2) For a sampling of references, see: Emerson M. Rabb, "Business Games as a Marketing Extension Tool," *Journal of Farm Economics*, 46:1024-1028, December 1964; David H. Hammond, J. Robert Strain, and C. Phillip Baumel, "Simplifying Management Games for Extension Programs," *Journal of Farm Economics*, 48:1028-1030, November 1966; Lowell D. Hill, "The Agribusiness Community as a Laboratory for Teaching Business Management: An Experiment in Undergraduate and Adult Education," *Journal of Farm Economics*, 49:1326-1331, December 1967.

TIPS FOR ANYONE WISHING TO WORK IN A DEVELOPING COUNTRY

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Much has been written about the need for international understanding. Understanding is essential in order for knowledge to be put to work. As used here, it includes all the processes involved in comprehending and judging situations so that effective decisions can be made and proper actions taken. Anyone wishing to work in a developing country should be committed to the furtherance of international understanding, and be willing to do the necessary preliminary work to acquire at least a minimum amount of such understanding.

In one sense, all countries are "developing countries," since all have a long way to go in achieving their desired national goals. In this article, however, a developing country is considered as one which has become free to determine its own destiny in the last twenty-five years or less. Many of them have been dominated and exploited by foreign powers for centuries prior to their independence. None has shared in the industrial revolution which advanced living standards so greatly in Western nations. Few can produce enough food to feed exploding populations.

The United States has six percent of the world's population, and consumes nearly one-third of the gross world product. (It is more correct to use the designation, "United States", rather than "America" as is often done by those who seem to forget that there are neighboring countries which are also part of America.) A certain degree of modesty is a useful attribute for potential overseas workers.

For humanitarian reasons and because of national self-interest, we have sent millions of dollars and thousands of technicians to assist newly developing nations. Skromme¹, writing in a recent issue of *Agricultural Engineering - The Journal of the American Society of Agricultural Engineers*, makes the following statements.

It has taken America a long time to learn that merely sending billions of dollars overseas is not an effective way to aid less developed countries. Often not only do these dollars appear wasted - but they may have done more harm than good! But exporting knowledge to show these people how they can help themselves usually is successful. Most underdeveloped countries have an extremely inefficient agriculture; most of the population must expend most of its efforts merely to provide sufficient food and materials for survival.

Skromme also says: "One of the best ways to aid developing countries is to help them develop their base industry of agriculture."

There is no doubt that the various foreign programs sponsored by United States private and public agencies will continue to create a need for agriculture, agricultural education, and related overseas personnel.

In order for U.S. workers in developing countries to be truly effective, they should have certain basic essential understandings. One of the first ones is an understanding of self. Honest answers to the following questions may be helpful:

1. Do I realize that working in a developing country can be hard and difficult?
2. Do I have the dedication and missionary zeal necessary to help men and women, boys and girls to a better and happier life?
3. Do I have a natural enthusiasm and optimism which will help overcome feelings of exasperation when progress seems slow?
4. Am I willing to help people understand their problems and work out solutions rather than telling them what they should do?
5. Will I be able to retain my cultural identity and still allow the people I work with to retain theirs?
6. Do I have the necessary confidence in my own ability to perform at the required level?
7. Is my health good enough to allow me to live and work effectively in a newly developing country?

Dr. Erly Diaz Brandao² lists ten characteristics necessary for a person to be effective in a technical assistance program:

1. He should be intelligent and well trained in his technical field of endeavor.
2. He should have a strong interest in learning the language.
3. He should have had experience, and the desire and ability to adjust to a new environment.
4. He should have a little of the spirit of a pioneer.
5. He should be tolerant of people's ideas and points of view.
6. He should be sure that he is going to be working with good people - people who are perhaps not as well trained technically, but nevertheless people of a high level of intelligence and good will.
7. He should have a willingness to work with what he encounters and to make changes from that point, without wanting to change everything immediately.
8. He should be enthusiastic, because in many cases he will need to sell his ideas and points of view.
9. He should appreciate that the important thing is the objectives of the project, and realize that these can be attained in a variety of forms; in other words, he needs to be flexible.
10. He should have a wife who shares these characteristics.

It is not always possible to recruit technicians for overseas work who have all the desired characteristics. The importance of each individual quality will vary according to the particular assignment. Many people in some developing countries, for example, are quite proficient in English as well as their country's language. In this instance the technician who speaks English will not find it quite so necessary to learn a second language. However, it is always a good idea to learn as many useful words and phrases of the country's language as possible.

Anyone deciding he would like to work in a foreign land should become familiar with the technical language and relevant literature of the field.

From the hundreds of publications available, the following are recommended as good starting points:

Education of Development Technicians - A Guide to Training Programs by Thomas F. Trail, Frederick A. Praeger, Publishers, Inc., 111 Fourth Avenue, New York, N. Y. 10003. 1968.

Traditional Cultures: and the Impact of Technological Change by George M. Foster, Harper and Row, Publishers, Inc., 49 East 33rd Street, New York, N. Y. 10016. 1962.

The two books are comprehensive, well written, and authored by recognized authorities with extensive but

differing backgrounds in international affairs. Most local libraries will have the books in their collections. It is well to remember that there often is little time to study once a contract has been signed to assist with a project in a foreign country. Getting the necessary immunization shots, filling out required forms, getting business affairs in order, and similar time-consuming activities leave little time for background reading.

After becoming familiar with the technical language and literature of overseas work, it is necessary to determine the opportunities an individual may have with a particular level of education and experience. There is a wide range of experience and degree of skill desired by the various agencies which recruit development technicians. Sometimes even within the same organization this range is surprisingly great. As mentioned by Trail³ in his excellent book: "Peace Corps volunteers probably best represent this range. The majority of volunteers recruited to work abroad are young, unskilled college graduates; however, in the same training program for the same project, one may find highly specialized college professors training for the same job."

Trail lists the following general characteristics of the typical technician:

1. His training and experience have been mainly within the U.S.
2. He knows no language other than English.
3. His knowledge of foreign cultures and environments is very slight.
4. His acquaintance with world events, U.S. history and foreign policy, and economic development is no more than the average professional within his group.
5. He has little knowledge, if any, of impact of technological change in the developing areas.
6. He is, in effect, a person with some degree of professional skill selected by the technical assistance agency to carry out some aspect of the program overseas.

Government, voluntary, business, university and religious agencies all have recruiting programs. The book by Trail

includes specific names and addresses of the various agencies. The more flexible an individual can be about such things as starting date and length of service, the easier it will be for him to obtain employment.

As noted by Foster⁴ in his book, "The peoples of newly developing countries recognize the world as changing rapidly; they want and need economic and technical help of many kinds. American technical experts in such fields as public health, agriculture, education, and community development are as well trained and professionally competent as any in the world."

Anyone who has worked successfully in a foreign country for any extended period of time will agree with Toynbee⁵ that the rapid expansion of technical assistance activities to the newly developing countries of the world is both man's greatest challenge and contribution of the twentieth century. The tips provided in this article should help anyone truly interested in becoming part of this great adventure to make decisions based on knowledge rather than unsupported guesses.

SELECTED REFERENCES

¹Lawrence H. Skromme, "Agricultural Engineering Abroad," *Agricultural Engineering*, 51, No. 4, (April, 1970), 221.

²Frlly Diaz Brandao, "Technical Assistance and Agricultural Education," *Agriculture and the University, Council on Higher Education in the American Republics, Institute of International Education*, 809 United Nations Plaza, New York, N. Y. 10017. p. 185.

³Thomas F. Trail, *Education of Development Technicians*, Frederick A. Praeger, Publishers, Inc., New York, N.Y. 1968, p. ix.

⁴George M. Foster, *Traditional Cultures*, Harper and Row, Publishers, Inc., New York, N.Y. 1962. p. 2.

⁵Arnold Toynbee, Interview on Meet the Press (New York: NBC, July 7, 1955).

Teaching the Analysis of Variance Concept¹

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Biological organisms are characterized by variation. The use of statistics to analyze biological variation has become well established. The analysis of variance is one of the most widely used procedures for analyzing biological experiments.

The analysis of variance concept and procedure were developed by R. A. Fisher in the 1920's and subsequently have been employed in many different statistical analyses. Any biological measurement, such as yield, height, chemical composition, rate of growth, etc., consists of various effects. For example, the weight of a pig would be affected by the population mean weight of pigs, the particular litter from which the pig came, the diet it had received, and some unexplainable factors. The analysis of variance permits the experimenter to objectively measure the various effects of components of a measurement. The variability in measurements or observations is analyzed and allocated to the various effects. The experimenter wants to know whether the variability due to controlled factors is meaningful in terms of the variability due to uncontrolled factors. Objectivity in analyzing research data is an essential part of the scientific method.

Greater emphasis on research appreciation and training has necessitated teaching introductory statistics courses at the undergraduate level. The purpose of this treatise is to develop an explanatory method of teaching the analysis of variance

concept in an introductory statistics course. The method will be illustrated for two of the simpler experimental designs – completely randomized and randomized complete block.

Completely randomized design – The completely randomized design (CRD) is the simplest experimental design. Treatments are randomly assigned to the entire experimental area; therefore, every experimental unit has an equal probability of receiving any treatment (Fig. 1). Advantages of the CRD result from its flexibility and simplicity. The number of observations may vary from treatment to treatment. The loss of information resulting from missing observations is small in comparison to losses in other designs. The number of degrees of freedom associated with experimental error is greater for the CRD than for other designs. The main disadvantage of the CRD results from the fact that all the variation among experimental units, except that due to treatments, is included in the experimental error. The CRD is suitable when the experimental units are homogeneous or when there is no systematic gradient in the variability among heterogeneous experimental units.

The model for the CRD is $X_{ij} = \mu + \tau_i + \epsilon_{ij}$. This is a linear or an additive model in which any observed value, X_{ij} , is the sum of three parts: μ , an overall mean; τ_i , a treatment effect; and ϵ_{ij} , the error or unexplained portion of the observation. The i 's refer to treatments and take on values from 1 to the number of treatments (t). The j 's refer to replications within

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