DEVELOPING AND FIELD TESTING DESIGN PARAMETERS FOR CUSTOMIZING AGRICULTURAL EXTENSION EDUCATION SYSTEMS IN DEVELOPING COUNTRIES

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Abstract

This developmental research project offers country developers, extension educators, and evaluators a design strategy for custom designing an appropriate extension education system through the use of evaluative instruments which analyze a developing country's situation. The research involved (a) a search of relevant literature to identify country-specific problems and components of extant extension education approaches resulting in the development of two instruments, "Country Analysis" and "Model Correlation", (b) a modified Delphi review to refine the instruments, and (c) field tests of the instruments in the People's Republic of China (PRC), Cambodia, and Turkmenistan.

Delphi panelists reinforced the core analytical categories and items of the original instruments while suggesting enhancements in format, clarity, and efficient usage. Field tests in the PRC and Cambodia confirmed the suitability of the instruments for evaluating existing extension education systems. The Turkmenistan field test substantiated the validity of the instruments for designing a new system.

Introduction

Developing countries view the partnership of research, education, and extension in traditional agricultural extension education systems as an adaptable model for improving their agrarian economies. The process of adaptation, however, has too often followed the traditional developmental project approach and been little more than the transplantation of a predefined extension education model into a developing country with little regard to existing country-specific factors which impact the effectiveness of a domestic extension system. As a result, less than satisfactory technology transfer has occurred, agricultural economic development has been slow, and agricultural extension has had a disappointing record (Wharton, 1984). Nonetheless, planners believe that extension education can promote development by

improving the capacity of small farmers to produce food and fiber, thus enabling them to become functional, contributing parts of the economic development process (Benor, Harrison & Baxter, 1984). The challenge is to design an extension education system, within country-specific parameters, which will effectively meet the established developmental goals of a country.

Purpose

The purpose of this developmental research project was to identify the factors to consider when designing an effective agricultural extension system for a developing country and then to link these factors to the components of existing extension education models to "custom" design an appropriate, effective extension system.

Methodology and Results

Specific research methods for this project included (a) identification of problems encountered in existing extension education systems of developing countries and outlined theoretical considerations, (b) identification of primary components of extant extension education models, (c) design of instruments to analyze country specific situations and correlate situations to model components, (d) refinement of the designed instruments through a modified-Delphi review, and (e) field testing of the finalized instruments in selected developing countries to derive country-specific recommendations for the establishment or review of agricultural extension education systems.

Problem areas and theoretical considerations impacting the success of an extension system were described in the literature (Maunder, 1972; Sigman & Swanson, 1984; Swanson, Farner & Bahal, 1990) and substantiated consideration of the following areas when designing an effective extension system:

1. Government Policies in Agriculture
2. Macro-Organization of an Extension Service
3. Responsibilities of an Extension Service
4. Linkages between Research and Extension
5. Programming Approach in Extension
6. Selection and Training of Extension Personnel
7. Local-Level Extension Staffing
8. Support Strategies for Local Extension Personnel
9. Geographic Factors
10. Climatic Factors
11. Political Factors
12. Economic Factors
13. Agricultural Factors

Primary components of extant extension education models were identified by reviewing descriptions of approaches to extension which have been employed over the past 40 years (Shaner, Phillip & Schmehl, 1982; Swanson & Claar, 1984). These approaches can be considered alternative extension models and may be identified as follows:

1. Conventional Agricultural Extension System
2. Training and Visit System
3. University Agricultural Extension System
4. Commodity Development and Production System
5. Integrated Agricultural Development System
6. Integrated Rural Development System
7. Farming Systems Research and Development System

An analysis of these models identified and compared the primary components of objectives, clientele, organization, approach, and the role of extension personnel. This analysis and subsequent correlation with identified existing and desired characteristics provided the conceptual framework for the project.

With this information as a foundation, two instruments were developed. The "Country Analysis Instrument" serves to identify and quantify various existing or desired characteristics within a country which impact the development of an extension system for that country, and the "Model Correlation Instrument" which correlates these identified impactors to particular components of existing models.

The original draft of the "Country Analysis Instrument" consisted of questions focusing on the major impactors identified in the review of literature and divided into the following general categories:

1. Geographic Situation
2. Climatic Situation
3. Demographic Situation
4. Political Situation
5. Economic Situation
6. Agricultural Situation
7. Infrastructure Situation
8. General or Desired Characteristics Impacting an Agricultural Extension Education System from Policy Makers' Perspective and Users' Perspective

The original draft of the "Model Correlation Instrument" consisted of questions designed to correlate the impactors identified by the "Country Analysis Instrument" with particular components of extant extension education models and to identify the best alternative components, thereby outlining the basic structural framework of an agricultural extension education system through appropriate design parameters. Parameters identified by the instrument include Objectives, Clientele, Organization, Educational Approach, and Role of Extension Personnel.

Once designed, the instruments were subjected to a modified Delphi review by a panel of recognized experts in extension education and development for evaluation and refinement. A total of 30 individuals were purposefully selected to review the instruments in three waves as outlined in Table 1.

The review panel was randomly divided into two groups, a "Primary Review Panel" of 20 members and a "Secondary Review Panel" of 10 members. Of the 30 reviewers originally seated, 27 completed the review process, 18 in the primary review panel and 9 in the secondary review panel.

Composite and progressive refinements were made to the instruments at the completion of each review wave. Suggestions for improvement fell into four primary categories: form, grammar, and style; language and cultural diversity; category appropriateness and effectiveness; and significance of specific category questions. They were incorporated into the revision of each wave at the discretion of the researcher to improve the format of the instruments, ensure their appropriateness for accomplishing the identified objectives, and enhance potential application.

Refinement of the originally designed instruments through the modified Delphi approach resulted in the "final instruments" for field application. The final "Country Analysis Instrument" comprises 77 classes of data which are further subdivided into specific data items. The data provide factors for consideration in determining appropriate extension system components. The number and selected examples of data classes are shown in Table 2.

The "Model Correlation Instrument" is organized into sections consistent with the five components of extension systems. For each component, relevant analysis factors from the "Country Analysis Instrument" are listed for interpreting the information gathered in the country analysis process.

Table 1.

Modified Delphi Approach Waves.

Wave	Review Panel	Items Provided	Items Returned
First	Primary of 20	Original Instruments Evaluation Form Letter of Explanation	Modified Instruments1 Completed Evaluation
Second	Secondary of 10	Revised Instruments1 Evaluation Form Letter of Explanation	Modified Instruments2 Completed Evaluation
Third	Complete of 30	Revised Instruments2 Evaluation Form Letter of Explanation and Thanks	Modified Instruments3 Completed Evaluation

Table 2.

Country Analysis Instrument Data Categories and Classes.

Category	Number of Classes	Selected Examples
Geographic Situation	11	Size, Land Distribution, Sub-Units
Climatic Situation	5	Average Regional Rainfall & Temperature
Demographic Situation	4	Population, Growth Rate, Cultural Groups
Political Situation	9	Form of Government, Administrative Set-up, Branches & Responsibilities
Economic Situation	11	Currency, GNP, Trade
Agricultural Situation	19	Land, Farm Size, Tenure, Farming Systems, Production, Agricultural Education, Research, Policy, Credit, Marketing, Development Goals
Desired Characteristics of Agricultural Extension System: Policymakers' & Users' Perspectives	18	Administration, Responsibilities, Funding, Staffing, Program Direction, Research Link

Field testing of the final instruments was done in the People's Republic of China (PRC), Cambodia, and Turkmenistan. Valuable experience was gained in instrument application procedures and the instruments were validated under practical application.

Field testing in the PRC and Cambodia was afforded by a 1994 Fulbright Grant. Specific evaluation procedures for the project included:

1. Referencing national and university library resources,
2. Securing statistical reports from government agencies,
3. Interviewing educators and government personnel, and
4. Surveying educators and clientele through focus groups.

Initial contact in the PRC was with faculty members of the Departments of History, Sociology, Education, and Economics at Beijing University. They provided access to library resources, student translators, introductions to governmental agencies and leaders, interviews, and arrangements for in-country interview and survey contacts.

Major portions of the Geographic, Climatic, Demographic, Economic, Agricultural, and Infrastructure Situation sections of the "Country Analysis Instrument" in the PRC were completed through the aid of student translators assigned by university faculty and junior clerks in the State Statistical Bureau and Ministry of Agriculture. A total of 21 interviews -- 10 university faculty, 9 senior officials of the Departments of Agriculture and Economics and the Institute of Economics, and 2 representatives of the Shenzen Economic Council -- enabled completion of major portions of the Political Situation and General or Desired Characteristics from Policy Makers' Perspective sections of the "Country Analysis Instrument".

Two focus group sessions were arranged to complete the General or Desired Characteristics from Users' Perspective section of the instrument. The first was arranged by the Institute of Economics in Xian and consisted of five farmer representatives of farming communities in townships surrounding Xian. The second was organized in Dunhuang by the Chinese Academy of Social Sciences and was conducted with eight farmers.

During a series of three exit interview sessions, personnel of the Chinese Academy of Social Sciences and faculty members of the Departments of Sociology and Education of Beijing University assisted with the interpretation of data collected by the "Country Analysis Instrument" through the previously described procedures. This analysis, including a prioritization of the information collected, accommodated the completion of the "Model Correlation Instrument" and, subsequently, an evaluation of the current agricultural extension education system of the PRC organized under the Chinese Ministry of Agriculture.

Results of instrument application in the form of suggested design parameters are summarized as follows:

Model Objectives should be:
1. established by the central federal administration.
2. defined as
   a. providing for broad-based agricultural development;
   b. improving the quality of life for the entire rural population;
   c. increasing food availability while maintaining low food prices.

Model Clientele should be:
1. target groups within the farm population, specifically production units of the primary commodities of pork, poultry and eggs, and cereal grains.

Model Organization should be:
1. administered by the Ministry of Agriculture.
2. responsible for agricultural production education and research and production input supply.
3. organized with staff and offices on national, provincial, prefecture, county, and township levels.
4. funded by the federal government through project profits.
5. staffed by university graduates at the national and provincial levels and technical school graduates at the prefecture, county, and township levels; men and women at all levels; and nationals at all levels.
6. staffed with administrators at the national and provincial levels, associate administrators and subject matter specialists at the prefecture and county levels, and field staff educators at the county and township levels with total staff numbers at each level depending upon numbers of farmers and regional production.
7. linked with research centers through locally administered research plots and dual-assigned personnel with both research and teaching responsibilities at the prefecture and county levels.

8. associated with farm supply and marketing systems on an informal basis, but not credit or promotional organizations.

Educational Approach should be:
1. agricultural information units for production of bulletins and teaching aids.
2. local extension workers contacting local production unit farmers on a fixed schedule.

Role of Local Extension Personnel should be:
1. consultant - identify farmer problems/needs and production constraints.
2. communicator - communicate farmer problems/needs and production constraints to subject-matter specialists and researchers.
3. educator - disseminate research-based information about new technology and demonstrate its practical application to farmers.
4. evaluator - work with local people to evaluate the effectiveness of new techniques and extension programs.
5. researcher - conduct on-farm research to determine practicality and effectiveness of new technology.
6. supplier - provide farmers with required inputs.

Arrangements in Cambodia were accommodated by the Cambodian Office of the Food and Agriculture Organization (FAO) of the United Nations and the Ministry of Agriculture. Staffs of both organizations provided statistical analysis information, interpreters, interviews, and introductions to governmental agencies and leaders. Major portions of the Geographic, Climatic, Demographic, Economic, Agricultural, and Infrastructure Situation sections of the "Country Analysis Instrument" for Cambodia were completed through the assistance of two junior staff members assigned by the Ministry of Agriculture. A total of 12 interviews with Vice Ministers and Department Directors in the Ministries of Agriculture and Education facilitated the completion of remaining portions of the situation sections and the General or Desired Characteristics from the Policy Makers' Perspective section.

As in the PRC field testing, a focus group was utilized to secure information to complete the General or Desired Characteristics from the Users' Perspective section of the "Country Analysis Instrument". The focus group consisted of seven farmers from the Mekong area.

One joint exit interview was conducted with representatives of FAO and the Ministries of Agriculture and Education. The session enabled presentation of the data and information collected through the application of the "Country Analysis Instrument", its interpretation, and its prioritization and input into the "Model Correlation Instrument". Results of instrument application in the form of suggested design parameters were discussed in detail and are summarized as follows:

Model Objectives should be:
1. established by the central federal administration with clientele advisory groups providing program input.
2. defined as
   a. increasing agricultural production for export to reduce balance of trade deficit;
   b. increasing agricultural production to increase real income of farmers;
   c. improving the quality of life for the entire rural population.

Model Clientele should be:
1. entire farm population.

Model Organization should be:
1. administered by the Ministry of Agriculture.
2. responsible for agricultural production education.
3. organized with staff and offices on national, provincial, and district levels.
4. funded by the federal government and supported with development assistance funds.
5. staffed by engineers (university graduates) at the national level, controllers (technical school graduates) at the provincial and district levels, and agents (one-year certificate holders) and skilled workers (secondary cycle graduates) at the village level; men and women at all levels; and nationals at all levels.

6. staffed with administrators at the national and provincial levels, subject matter specialists at the national and provincial levels, specialist extension officers at the district level, and farmer technicians at the village level with total numbers at each level depending upon the number of farmers and regional production.
7. linked with research only through local demonstration plots and advisement of local needs and results of new technology application; research to be administered by National Agricultural Research System (NARS), national universities, and autonomous international research institutes or private companies (Non-Governmental Organizations [NGOs]).
8. associated with no other credit, supply, marketing, or promotional organizations on a formal or informal basis.

Educational Approach should be:

1. local extension personnel using research-based information to help local people identify and establish need priorities and then request instructional assistance from subject matter specialists on selected topics.
2. national and provincial level support of NGO extension development projects.

Role of Local Extension Personnel should be:

1. consultant - identify farmer problems/needs and production constraints.
2. communicator - communicate farmer problems/needs and production constraints to subject-matter specialists and researchers.
3. educator - disseminate research-based information about new technology and demonstrate its practical application to farmers.
4. evaluator - work with local people to evaluate the effectiveness of new techniques and extension programs.
5. motivator - encourage application of improved methods or identified solutions to problems.

Field testing of the instruments in Turkmenistan was accomplished as a part of a 1995 United States Agency for International Development (USAID) project. Turkmenistan is one of the

Newly Independent States (NIS) of Central Asia formed as a result of the breakup of the Soviet Union. The specific purpose of the project was to assist the country in investigating the potential formation of an agricultural extension education system, a uniquely appropriate project for instrument field testing.

Specific procedures for the project included:

1. Securing statistical data from governmental and international development agencies.
2. Interviewing educators and government personnel.
3. Surveying clientele through focus groups.

Primary contact in Turkmenistan was with in-country personnel of the USAID office in Ashgabat. An Assistant Program Manager and Project Interpreter were assigned to the project and assisted in all aspects of the identified procedures, including translating the instruments, collecting applicable government statistics, arranging and recording interviews and focus groups, and interpreting written documents and verbal exchanges. Large portions of the Geographic, Climatic, Demographic, Economic, Agricultural, and Infrastructure Situation sections of the "Country Analysis Instrument" were completed through statistical information provided by USAID and the Ministry of Agriculture. Remaining portions of the instrument, including the General or Desired Characteristics from Policy Makers' Perspective section, were completed through individual interviews.

Interviews were held with five Directors and Vice Directors of the Ministry of Agriculture in Ashgabat, four faculty members of the State Agricultural University in Chardzhou, the Governor of the Chardzhou Oblast and the Governor of the Danow District of Chardzhou, five Government Bureau Chiefs in Chardzhou and Danow, and nine farmers in the Danow District, for a total of 25 interviews. Additionally, two focus groups, one with 12 farmers in the Danow District and a second with 16 farmers in the Ashgabat area, facilitated completion of the General or Desired

Characteristics from Users' Perspective section of the "Country Analysis Instrument".

An exit interview with representatives of the Ministry of Agriculture and USAID in the final week of the project facilitated the application of the "Model Correlation Instrument". Suggested design parameters are summarized as follows:

Model Objectives should be:
1. established by the central federal administration with clientele advisory groups providing program input.
2. defined as
   a. providing and/or maintaining low consumer food prices;
   b. increasing agricultural production to increase real income of farmers;
   c. improving the quality of life for the entire rural population;
   d. providing for broad-based agricultural development;
   e. supporting communities toward the goal of community development.

Model Clientele should be:
1. entire farm population.

Model Organization should be:
1. administered by the Ministry of Agriculture.
2. responsible for administration and direction, agricultural production and research, and small business development.
3. organized with staff and offices on national, oblast, and district levels.
4. funded by the federal government, generated project funds, and development assistance funds.
5. staffed with university graduates at the national and oblast levels and specially trained individuals at the district level; men and women at all levels; and nationals at all levels with expatriate support for development projects.
6. staffed with administrators at the national and oblast levels, subject-matter specialists/researchers and educators at the oblast level, and extension workers at the district level with total numbers at each level depending upon the number of farmers and district production.
7. linked with research through locally administered research plots and advisement of local needs and results of new technology application; research to be administered by State Agricultural University and development assistance organizations.
8. associated with credit, supply, and marketing organizations on a formal basis as required in specific development projects.

Educational Approach should be:
1. agricultural information units for production of bulletins and teaching aids;
2. local extension workers contact local farmers on a fixed schedule;
3. local extension workers receive training on a fixed schedule;
4. local extension personnel using research-based information to help local people identify and establish need priorities and then request instructional assistance from subject matter specialists on selected topics; and
5. development project established in which the organization provides previously limited inputs and assumes the responsibility for coordinating all facets of agricultural production, including credit, supply, technical assistance, and marketing services.

Role of Local Extension Personnel should be:
1. consultant - identify farmer problems/needs and production constraints.
2. advisor - work with local people to identify and prioritize problems/needs and possible solutions.
3. communicator - communicate farmer problems/needs and production constraints to subject-matter specialists and researchers.
4. educator - disseminate research-based information about new technology and demonstrate its practical application to farmers.
5. motivator - encourage application of improved methods or identified solutions to problems.
6. evaluator - work with local people to evaluate the effectiveness of new techniques and extension programs.

7. researcher - conduct on-farm research to determine the practicality and effectiveness of new technology.
8. government administrator - administer government programs and policies on the local level.
9. supplier - provide farmers with required inputs.
10. marketer - coordinate product marketing.

Conclusions and Recommendations

The research procedures used in the study were effective and appropriate for the defined purpose. The review of literature revealed problems encountered in current extension education systems, outlined theoretical considerations, and descriptions of extant extension education models. The modified Delphi review refined the project instruments by verifying the significant analytical categories and enhancing instrument clarity, efficiency, and universality. Field testing provided valuable experience in instrument application procedures and validated the instruments. The field tests in the People's Republic of China and Cambodia confirmed the suitability of the instruments in evaluating an existing extension education system, and the Turkmenistan field test substantiated the suitability of the instruments when designing a new extension system.

Additional field testing is recommended with emphasis in two primary areas. First is further refinement of the instruments to enhance their usefulness in a variety of developing country situations. Second is the evaluation of various instrument application techniques. This study utilized resource referencing, interviews with educators and government decision-makers, and clientele focus groups. Other techniques may be equally or more viable.

Obviously, the implementation of recommendations based on the use of these instruments and follow-up studies evaluating the effectiveness of a "custom designed" extension system would be the ultimate test of instrument validity.

Educational Significance

Instruments which allow professional project analysts to identify and quantify factors which impact the effectiveness of an agricultural extension system in developing countries and then correlate those factors with components of existing extension education models can be effective tools for designing country specific extension education systems. Such an approach to the "customization" of a technology transfer system will more effectively contribute to the growth and development of a rural economy, thereby enhancing the ability of a country to meet defined developmental goals and is worthy of study.

The design and use of evaluative instruments and techniques to diagnose country-specific situations and determine appropriate design parameters for extension education systems in developing countries has potential for use by development specialists and extension educators. It also demonstrates the value of linking theory with practice in evaluating country-specific systems. Such an approach to the "customization" of a technology transfer system can contribute to the growth and development of rural economies, thereby enhancing the ability of a country to meet defined developmental goals.

The customized approach suggested by this project should appeal to country developers looking for strategies to deal with differences which abound across countries, extension educators seeking ways to adapt education strategy to diverse situations, and evaluators who initiate studies and collaborate with country developers and extension educators in project design and management.

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