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ABSTRACT

A study evaluated the cacao farmer training program in the Dominican Republic by testing hypothesized relationships among reactions, knowledge and skills, attitudes, aspirations, and some selected demographic characteristics of farmers who attended programs. Bennett's hierarchical model of program evaluation was used as the framework of the study. Target population consisted of 510 male regional cacao farmers. A sample of 200 farmers was selected, and 160 completed interviews by researchers. The study found that most farmers had participated in the program one or two times, almost all had favorable reactions to it and high perceptions of knowledge and skills gained, as well as high intentions to apply knowledge and skills. The study also found that older farmers had a more negative attitude toward information given, whereas a small positive correlation was found between favorable reaction to the program and perception of skills gained. The study concluded that Bennett's model was a coherent framework for this type of research and that the study course should continue with modifications designed to facilitate high involvement of course participants. (27 references) (KC)

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Summary of Research

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Use of Bennett's Hierarchical Model in the Evaluation of the Extension Education Program for Cacao Farmers in the Northeast Region of the Dominican Republic

Saturnino De los Santos and
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Introduction

Rural and agricultural development are major concerns of most developing countries, especially in Latin America. To bring about socio-economic transformation, most developing countries need to increase agricultural production and rural productivity, thereby, increasing the income level of the rural population and improving the quality of life (Rodriguez, 1982).

The Dominican Republic is no exception with nearly two-thirds of the country's export earnings derived from agriculture. In the years 1971/72 and 1977/78, the agricultural sector accounted for 73 and 68 percent, respectively, of the total value of exports (Guillen, Duran, Vargas, Cepeda, Brioso, and Perez, 1982). The lack of adequate technological development, however, in the agricultural sector has been responsible for low agricul-

tural production (Guillen et al., 1982), which in turn, is indirectly related to low income, unemployment, illiteracy, malnutrition and other problems in rural areas.

As a response to these identified needs, the Agricultural Extension Service was established in the Dominican Republic in 1962. The intention was to provide the farmers the knowledge and skills to enable them to participate more effectively in making decisions related to agricultural production and rural development. Also, the program was intended to assist in the development of favorable attitudes toward the use of modern agricultural technology (Almanzar, d'Oleo, and Diaz, 1984).

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In 1973 an adult agricultural education program, "Programa de Capacitacion Agropecuaria," was initiated and conducted by the State Secretariat of Agriculture (De Leon, 1982). In 1979, the "Programa de Capacitacion de Cacao" (cacao training program) was included as a major component of this national training program being implemented by the Secretariat of Agriculture because cacao represents the third most important export crop for the Dominican Republic (Javier, 1984).

Stenvenson (1984) stated that 65 percent of the cacao plantations in the Dominican Republic were well established (more than seventy years old) but the average production per hectare was still too low. Citing survey results conducted by the Secretariat of Agriculture in 1981, Sanchez (1985) reported that only 2 percent of the area under cacao cultivation used fertilizers, 2.5 percent used insecticides and fungicides, and 23 percent implemented pest control techniques. Furthermore, Sanchez indicated that only 20 percent of the area under cultivation had hybrid varieties, pointing to the grim fact that the cacao farmers just did not take advantage of the modern technology available.

The cacao training program, initiated in 1979, was developed for agricultural technicians, cacao farmers, and people involved as the labor force with the cacao crop. The major purpose of the program was to impart knowledge and skills related to cacao production and harvest management, through the use of improved practices.

The methodology being used to implement the cacao training program included: study courses, demonstrations, field days, lecture meetings, and sharing meetings (State Secretariat of Agriculture, SEA, 1980).

Since the cacao training program began, the program has been the strongest in the Northeast Region of the Dominican Republic. This region is the most important region for cacao production in the country (Bolling and Rivera, 1983). In addition, the experimental center for the cacao crop and the national center for the cacao crop-related training are located in the Northeast Region.

Need for the Study

The adult agricultural training program currently in place, has been involved in very few studies related to its basic educational components such as the program planning process, content, and educational methodology. No research has been conducted to determine the farmers' reactions to the educational programs, the farmers' attitudes toward the information given, the farmers' knowledge and skills gained, and the aspirations of the farmers related to educational programs. Hansen, Antonini, Merritt, Del Rio, and Strasma (1987) suggested that the major research and development centers in the Dominican Republic were dedicated to conducting technical and research activities such as soil testing.

As for any educational program, the relevance of the cacao program called for some type of evaluation that would investigate the relationship between characteristics and outcomes related to participation. Therefore, a study addressing the reactions, knowledge and skills gained, attitudes, and aspirations was needed to identify the problems related to the cacao farmers agricultural education program.

Purpose and Objectives

The purpose of this study was to evaluate the cacao training program by testing

hypothesized relationships among reactions, knowledge and skills, attitudes, aspirations, and some selected demographic characteristics of farmers who attended the cacao training programs in the Northeast Region of the Dominican Republic. Independent variables of the study were: age of the farmer; farmer's educational level; size of farm; extent of farmer participation; reaction to the program; farmer's perceived knowledge and skills gained; and farmer's attitude toward information given. The dependent variable was intention to apply knowledge and skills gained. Three specific research objectives were defined: (1) to determine the levels of the independent and dependent variables among farmers trained through the cacao training program in the Northeast Region of the Dominican Republic; (2) to determine the nature and strength of relationships suggested by twenty-two hypotheses formulated from review of the related literature; and (3) to determine the best predictor(s) of the dependent variable "farmers' aspirations" ("intention to apply knowledge and skills gained" through the training program).

Bennett's Hierarchical model of program evaluation (Bennett, 1975) was used as the framework for the study. Conceptualized by Claude Bennett in 1975, Bennett's Hierarchy has served as the evaluation model for the Cooperative Extension Service since that time. State impact studies, national assessments, and many local evaluations have been planned and implemented using, as the framework, Bennett's comprehensive model (Rivera, Bennett and Walker, 1983; Wilson, Wissemann and Moore, 1982; Long, 1987; Forest and Marshal, 1987; McClish, 1988; De los Santos, 1988; Patton, 1986). In addition, many training materials have been developed based on the model (Allen, Barrett and Keffer, ND; Sawyer, 1984; Youmans, 1986).

The hierarchy contains two major components, INPUTS to a program and OUTCOMES related to those inputs. Any possible variable planned for or measured in a program evaluation can be placed in one of the seven levels of the hierarchy which make up the two basic components.

Contained within the INPUTS component, three separate ordered categories are identified: inputs, activities, and people involvement. Inputs include staff qualifications and time, money and other tangible resources, and any other input which is needed to plan and implement activities. Activities are identified as any events which take place in the life of an educational program which includes its conception, planning, implementation, or evaluation. Activities can include marketing, teaching, and administration. The third level of the INPUTS of a program is the client (people) involvement which encompasses client demographics, numbers, and the extent of involvement.

If, in the hierarchy, level one, properly planned and implemented, leads to level two and so on, then the three levels which make up the INPUTS to a program, as a group, should lead to certain OUTCOMES. Those outcomes have been categorized into four levels beginning with a basic, common outcome of any participation, peoples' reactions. Reactions include satisfaction with participation, suggestions related to improvement of that participation and evaluation of the resources (staff, curriculum) involved. Essentially, reactions only deal with actual participation, not subject matter.

Reactions to content/subject matter, would be classified as attitude, which falls in the next level of the OUTCOMES, KASA.

KASA represents knowledge, attitude, skills, and aspirations to behave. Again, remembering the hierarchical nature of the model, positive reactions should lead to improved KASA. Following that logic, then, a positive change in KASA should prepare the way for success at the next level, behavior or sustained practice change.

Through the behavior change level, the hierarchy has encompassed only individual experiences and changes. At the final level of the hierarchy, end results, changes within a unit greater than an individual are hypothesized to occur. For example, an entire community, or ecological entity, or economic situation may be affected, based on the success of changes (in knowledge, attitude, skills, aspirations, and behavior) made by individuals at lower levels of the hierarchy. The assumption made about end results is that they will only occur if enough individuals have changed behavior. The effect is cumulative in that the larger the number of individuals who experience change from the program, the stronger the relationship should be between lower levels and final level, and end results.

The hierarchical relationships among variables contained in the OUTCOMES component of the model are hypothesized based on the work of Ajzen and Fishbein (1980) and others whose theory of action models impose precursors to behavior which include attitude, knowledge, and behavioral intentions (aspirations). Bennett's model puts knowledge and attitude as well as aspirations on an equal level of possible independent variables in a model with behavior as the dependent variable.

Many studies have investigated the sequential order of knowledge, attitude, and

aspirations. The actual ordering of these variables is still in question, however, theorists tend to place intentions immediately before behavior (Ajzen and Fishbein, 1980; Locke, 1969; Mobley, Griffeth, Hand and Meglino, 1979; Miller, Katerberg and Hulin, 1979). In studies which investigate ordering of variables (cause and effect), experiments are desired. Because of the unlikely feat of manipulation of the specified independent variables (knowledge, attitude, aspirations), true order is difficult to determine.

The nature of the two-component model not only allows the researcher to group INPUT variables and OUTCOME variables in a two-step sequence but allows the investigation to go further to identify at least the temporal arrangement of variables between the two components (an input comes before an outcome). The current study sought to investigate the hypothesized hierarchical arrangement of variables within and between the two components.

Methodology

This was an ex post facto correlational research design which allowed the researcher to determine the nature and strength of relationships between variables.

Population and Subject Selection

The target population for this study consisted of 510 male cacao farmers in the Northeast Region of the Dominican Republic, who participated in the "Programa de Capacitacion de Cacao" implemented by the Secretariat of Agriculture offered from 1983 through 1987. Men comprised almost all of Extension clientele in the Dominican Republic. Therefore the variable gender was held constant by including only males in the study.

A sample of 200 farmers who participated in the training program was selected using a simple random sampling procedure. This sample size and the procedure employed permitted the use of inferential statistics assuming error of .07.

Instrumentation

The instrument was an interview guide developed by the researchers. Content validity was determined using a panel of experts, consisting of both Spanish and English speaking experts in content and measurement. Reliability measures using Cronbach's alphas for the summated scales were determined after data collection but before analysis. Scales were adjusted to produce alphas ranging from .60 to .84.

Data Collection

Data were collected from April 19 through April 23, 1988, using the face-to-face interview technique. Of the 200 cacao farmers included in the sample, 160 questionnaire guides were completed for a data sample of 80 percent. Interviews were conducted by extensionists from the Northeast Region who were trained by the researchers in interview techniques.

No follow-up of non-respondents was conducted because those individuals had either moved or could not be located. There is no reason to believe that the 160 interviewed are different than the 40 who were not located based on the fact that the act of moving is fairly routine for Dominican farmers. An additional reason for non-response was use of the formal name in the search for respondents rather than the nickname which neighbors use.

Descriptive Analysis

Descriptive statistics such as frequencies, percentages, measures of central tendency, and variability were used to organize and summarize the data. Correlation and regression techniques were used to determine the nature and strength of relationships.

Findings

The findings are organized and presented according to the objectives of the study.

Objective One

Findings regarding demographic characteristics revealed that the average age of farmers was 46.5 years, 71 percent of the farmers had 6 years or less of formal schooling, and 91 percent had below a high school level education. The average size of farm was 63.3 tareas under cacao cultivation (sd = 67.6). (1 tarea = 629 square meters.)

Farmers' involvement with the cacao training program was measured by the number of times that the farmers reported having attended each of the six types of activities used to deliver the program. On the average, the extent of farmers' participation ranged from 1 to 2 times for the activities.

The majority of farmers had positive reactions to the cacao training program (96.8 percent), high perceptions of knowledge and skills gained (95.5 percent), and favorable attitudes toward the information they received through the program (98.8 percent). The findings also suggested that

there were a fairly high level of intention to apply knowledge and skills gained through the training program among the cacao farmers, with 83 percent reporting that their decision was to "definitely apply" the information (17 percent indicated that 'hey would not apply or may apply).

Three important additional findings in this study included: (1) the farmers' most preferred types of activities within the cacao training program were the study course, the field day, and the lecture meeting; (2) the most preferred time for course attendance was the second half of the week; (3) the course location was an important factor affecting farmers' involvement with the training program with farmers preferring a location in close proximity to their home.

Objective Two

Seven hypotheses dealt with relationships between independent variables and the dependent variable "intention to apply knowledge and skills gained". Pearson Product Moment Correlation Coefficients were computed, using the farmer as the unit of analysis. According to table 1, findings revealed that there were low positive relationships between "intention to apply knowledge and skills gained" and the variables "reaction to the program" ($r = .191$); "farmer's perceived knowledge and skills gained" ($r=.134$); and "extent of farmer participation" (involvement) ($r=.196$). A low negative relationship was found between "intention to apply knowledge and skills gained" and "farmer's educational level" ($r=-.131$). Furthermore, negligible relation-

Table 1
PEARSON CORRELATION COEFFICIENTS FOR THE RELATIONSHIPS
BETWEEN VARIABLES

	1	2	3	4	5	6	7	8
1	1.00							
2	.173*	1.0						
3	.035*	.302*	1.00					
4	.191*	.134	-.007	1.00				
5	.020	-1.74*	-.113	-.014	1.00			
6	.012	.211*	.029	-.131	-.410*	1.00		
7	-.036	.148*	-.003	-.067	.128	.051	1.00	
8	-.085	.204*	.098	.196*	.123	.107	.014	1.00

n = 146

* $p < .07$

1. Reaction to the program.
2. Knowledge and skills gained.
3. Attitude toward information given.
4. Aspiration (Intention to apply knowledge and skills gained).
5. Age.
6. Educational level.
7. Farm size.
8. Involvement (Extent of participation).

ships were determined by the extremely small size of the correlation coefficients between "intention to apply knowledge and skills gained" and the independent variables "farmer's attitude toward information given" ($r=.007$); "farmer's age" ($r=.014$); and "farm size" ($r=.067$).

Fifteen hypotheses suggested relationships between various independent variables. Results of the Pearson Product Moment Correlation coefficients showed that negligible relationships were found between "reaction to the program" and the following variables: "age of the farmer" ($r=.020$), "farmer's educational level" ($r=.012$), "size of farm" ($r=-.036$), and "extent of farmer's participation" (involvement) ($r=-.085$). Even though the correlation coefficients for these relationships were in the opposite direction to those suggested by the hypotheses, they were extremely small. The demographic characteristics (age, educational level, and size of farm) as well as "extent of farmer participation" were not related to "reaction to the cacao training program."

A low positive relationship ($r=.173$) was found between "reaction to the program" and "farmer's perceived knowledge and skills gained." Likewise, a moderate positive relationship ($r=.305$) was found between "reaction to the program" and "farmer's attitude toward information given." Farmers who had a positive reaction to the cacao training program tended to have high perceptions of knowledge and skills gained by participating in the program. Also, a positive attitude toward information given tended to be accompanied by a positive reaction to the program.

Findings indicated that farmer's perception of knowledge and skills gained was related to "age" ($r=-.174$); "educational level" ($r=.211$); "size of farm" ($r=.149$); "ex-

tent of farmer participation" ($r=.204$); and "attitude toward information given" ($r=.302$).

Findings revealed that the older a farmer was, the more negative the attitude toward information given through the cacao training program ($r=-.113$). There were negligible relationships between "farmer's attitude toward information given" and the variables "educational level" ($r=.029$); "size of farm" ($r=.003$); and "extent of farmer participation" (involvement) ($r=.098$).

Objective Three

Stepwise multiple regression was used to enter each independent variable into a multiple regression equation with "intention to apply knowledge and skills gained" as the dependent variable. Three independent variables were in the set of best predictors of the dependent variable. These variables were "extent of farmer participation" (involvement), "reaction to the program", and "educational level". The total amount of variance accounted for by the linear combination of these three variables was 11 percent ($R^2=.1068$, Table 2).

Conclusions and Implications

The following conclusions and implications were drawn:

1. Bennett's hierarchical model of program evaluation proved to be a coherent framework for this study. Hypotheses were formulated and tested based on a sound theory of inputs to outcomes. Many of the hypothesized relationships were supported, providing additional evidence of Bennett's theory.

Table 2

REGRESSION OF INTENTION TO APPLY KNOWLEDGE
AND SKILLS GAINED ON SELECTED VARIABLES

Independent variable entered in equation	R	R ²	b	t	Significant t
Involvement (extent of participation)	.1986	.0386	.0093	2.89	.0045
Reaction to the program	.2864	.0820	.1999	2.67	.0085
Educational level	.3267	.1068	-.0404	-1.98	.0049
(Constant)			(1.040)		

(F=5.66; p < .07; Fcrit. 5.66)

Regression model:

$$Y' = 1.040 + .0093 (\text{involvement}) + .1999 (\text{reaction to the program}) - .0442 (\text{educational level}).$$

2. The cacao training program being implemented by the Secretariat of Agriculture among farmers in the Northeast Region of the Dominican Republic, has a heterogeneous population in terms of age and farm size hold. The educational level of the farmers is low.
3. The general level of farmer's involvement with the cacao training program can be defined as low (average participation being 1-2 times). Many farmers felt themselves as having little contact with the program. This seemed to be more related to the way the program was organized and conducted than to the willingness of the farmers to participate. Involvement was determined to be a very important indicator of farmers' intentions to apply improved practices and technology.
4. The farmers had positive reactions to the cacao training program, high perceptions of knowledge and skills gained, and favorable attitudes toward the information they received through the program. This information is very important not only as a measure of usefulness and effectiveness of the program, but also because it provides a good foundation for future planning related to the training program.
5. Findings suggested that there was a fairly high level of intention to apply knowledge and skills gained through the training program among the cacao farmers. There were indications that farmers' intentions to apply knowledge and skills gained through the training program were positively related to the farmers' reaction to the program, their perceptions of knowledge and skills gained, and the extent of their participation

with the program. In fact, "farmers' reactions to the program" and "extent of farmers' participation" were included in the set of best predictors of "intention to apply knowledge and skills gained" through the cacao training program. Therefore, according to Bennett's Hierarchy and the results of this study, if program developers pay particular attention to those variables, participants should be very likely to have high aspirations to use what has been taught.

6. There was a negative relationship between farmers' intentions to apply knowledge and skills gained and their educational level. Farmers' with a lower level of education seemed to be more committed to follow recommendations involving the implementation of new practices and technology given to them through the cacao training program. The more educated farmer seemed to be more independent about what to do with respect to his cacao enterprise. This result contradicted research findings reported by Fay (1962) and Sing and Tripathi (1972), yet for this population may make logical sense based on the nature and needs of the Dominican farmer.
7. The farmer's willingness to apply new technology did not seem to be related to age, farm size, nor to attitude with respect to the information given. Thus, knowledge about these characteristics would not help in terms of predicting farmers' intention to behave with respect to the knowledge and skills they gained by participating in the cacao training program. The indication was that regardless of age, farm size, and attitude, aspirations to apply information may occur.
8. The results related to the farmers' most preferred types of activities and time for

course attendance suggested that in future planning for delivering the cacao training program, special attention should be given to study courses, field days, and lectures meetings. Also higher study course involvement could be assured by planning courses for the second half of the week rather than for the first half.

9. The findings of this study can be used to aid planners and administrators in decision-making, and help to develop guidelines for policy making within the agricultural sector. These findings should be available for the use of extension personnel as well as others interested in the Agricultural Extension Service or educational organizations similar to the Extension Service.
10. The results of this study can be generalized to the sample and setting studied, but they may have potential application to other farmer populations in the Northeast as well as other regions in the Dominican Republic.

Recommendations

Based on the findings, conclusions, and implications of the study, the following recommendations were made:

1. Bennett's hierarchical model of program evaluation is recommended to the Secretariat of Agriculture of the Dominican Republic as a reliable framework to address the evaluation of other programs considered important components of the Extension Service. Such a model will help in establishing the current situation of the agricultural extension service in the country and suggesting an appropriate course of action to meet future challenges concerning rural development.

2. The study course should continue as the most relevant activity to deliver the program, followed by field day and lectures.
3. Highly educated farmers may need additional information and new methods of delivery based on their lower intentions to apply knowledge and skills.
4. While farmers' age and farm size make no difference related to intentions to apply knowledge and skills, the study course should be conveniently located close to where farmers live.
5. The second half of the week is suggested for course activity.
6. Reaction to the program and extent of farmers' involvement with the program area are very important indicators in farmers' intentions to apply knowledge and skills gained. Administrators, supervisors, and extension personnel working for the cacao training program should make every effort to insure a positive reaction as well as to facilitate high involvement of the farmers.
7. The Secretariat of Agriculture should be aware of the farmers' perceptions of the overall program to make every necessary adjustment related to organization, resource allocation, and training methodology used.

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SUMMARY OF RESEARCH

Rural and agricultural development are major concerns of most developing countries. The Agricultural Education Service established in the Dominican Republic in 1962 has a primary purpose providing the farmers with the knowledge and skills to enable them to participate more effectively in making decisions related to agricultural production and rural development. This study reports research which determines the farmers' reactions to the educational programs, the farmers' attitudes toward the information given, the farmers' knowledge and skills gained, and the aspirations of the farmers related to educational programs. It should be of interest to individuals contemplating similar work in other countries.

This summary is based on a thesis by Saturnino De los Santos under the direction of Emmalou Van Tilburg Norland. Saturnino De los Santos was a graduate student in the Department of Agricultural Education at The Ohio State University. He is currently pursuing a Ph.D. degree in the Department. Dr. Norland is an Assistant Professor, Department of Agricultural Education, the Ohio State University. Special appreciation is due to Robert A. Martin, Iowa State University; Stacy A. Gartin, West Virginia University; and Richard W. Clark, The Ohio University for their critical review of the manuscript prior to publication.

Research has been an important function of the Department of Agricultural Education since it was established in 1917. Research conducted by the Department has generally been in the form of graduate theses, staff studies, and funded research. It is the purpose of this series to make useful knowledge from such research available to practitioners in the profession. Individuals desiring additional information on this topic should examine the references cited.

Wesley E. Budke
Department of Agricultural Education

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