July 1966

LTC NO. 21

THE LAND TENURE CENTER
310 King Hall
University of Wisconsin
Madison, Wisconsin 53706

INNOVATIVENESS AND RELATED FACTORS IN A RURAL COLOMBIAN COMMUNITY

by

Robert Whittenbarger and Eugenio Maffei

Paper to be presented at the Annual Meetings of the Rural Sociological Society, Miami Beach, Florida, August 27-29, 1966.

INNOVATIVENESS AND RELATED FACTORS IN A RURAL COLOMBIAN COMMUNITY

by

Robert Whittenbarger and Eugenio Maffei[1]

In the course of work in the less developed countries, and in the United States as well, one of the major areas of sociological research has been the investigation of the nature of the process involved in the adoption of innovations. These studies have been of unquestioned importance in the United States and other developed countries. If indications are accurate as to the effects of the adoption of improved farm practices on the material well-being of the peasant populations of the less-developed countries, research of this nature is destined to be of even greater and more immediate importance in the area of the Sociology of Development.

Even though the authors believe that the adoption process and its consequences are intimately related to the issue of social change, the present paper attempts only to clarify some of the relationships between innovativeness and several selected independent variables.

According to a recent extensive summary of research done on the diffusion of innovations,[2] 60 studies designated

innovativeness as the dependent variable. Among these, 27 studies found farm size to be positively associated with innovativeness; 17 studies found a positive relationship between the dependent variable and "contact with information"; the number of years of education was significantly correlated in 24 studies; and in three, attitude toward credit was positively related to innovativeness.

Based on these findings, the following propositions were considered for testing and were incorporated into an a priori model:[3]

I. The greater the level of education, the greater the degree of innovativeness.

II. The greater the degree of utilization of mass media, the greater the degree of innovativeness.

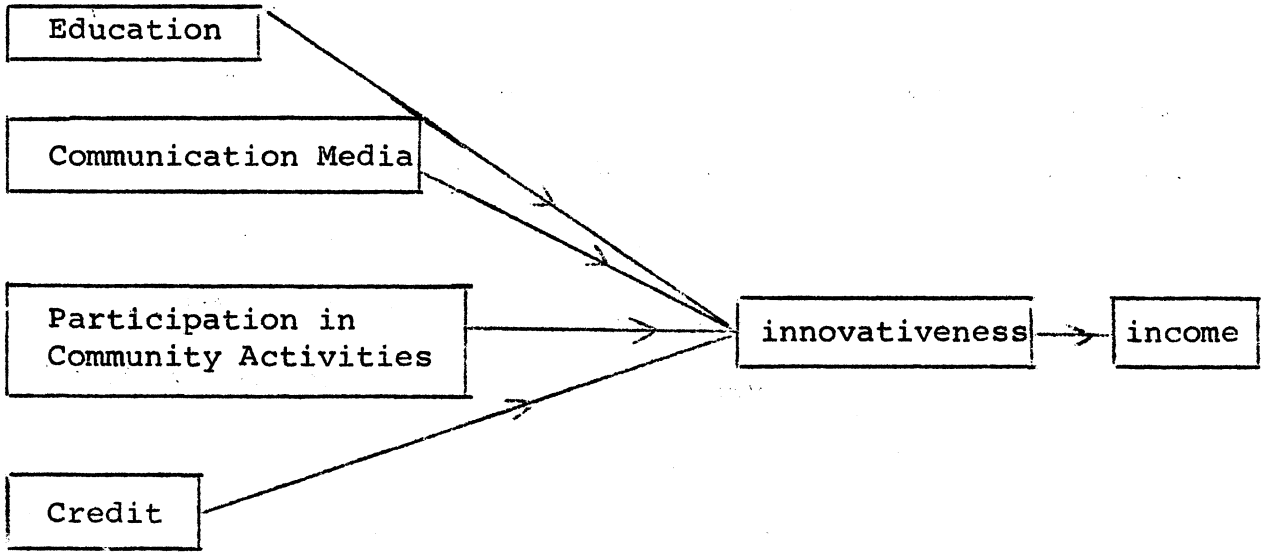
III. The greater the degree of credit acceptance, the greater the degree of innovativeness.

IV. The greater the degree of participation in community activities, the greater the degree of innovativeness.

V. The greater the degree of innovativeness, the greater the level of income.

It is now possible to draw the following schema which shows the relationship between the variables. Thus the variables have been structured as a short propositional chain. Therefore, innovativeness is the dependent variable and at the same time the determinant or independent variable of income.

SCHEMA I (A Priori Model)



The data used to test these hypotheses were gathered in Contadero, Nariño, Colombia.[4] The department, or state, of Nariño occupies the southwestern corner of Colombia. On its western boundary lies the Pacific Ocean and to the south, Ecuador.

Contadero, the municipio[5] in which the larger study was done, is located about 30 miles southwest of Pasto, the departmental capital, and about 10 miles north of the Ecuadorian border.

Contadero was chosen as a study area from approximately twenty municipios which had been the objects of preliminary

surveys using areas of minifundio, present or past existence of Indian reservations, and the traditional use of mingas[6] as the criteria for selection.

The area of the municipio is 17.3 square miles. There are wide variations in climate in the regions between approximately 6,600 and 10,000 feet above sea level where the temperature ranges between yearly average extremes of 43 and 62 degrees Fahrenheit. The average yearly temperature in Contadero, the "county seat," is 59 degrees.[7]

The terrain within the municipio is extremely hilly, level areas being practically non-existent. The principal crops are barley, wheat, corn, potatoes, and beans.

The Indian reservation of which Contadero was a part, was disbanded in 1941. Prior to that time, communality was emphasized and land was community owned though privately cultivated. In 1941, title was given to individuals so that each owned a small parcel of land. Since that time, considerable fragmentation has taken place. For the sample of 92 used in the basic study, the average size of landholding was approximately 8.4 acres. If the six individuals who have farms of greater than 32 acres are excluded, the average size is reduced to 5.5 acres. The average size of the individual plots for the entire

sample is 2.7 acres; again excluding the "large" landholdings, the average plot size falls to 2.0 acres.

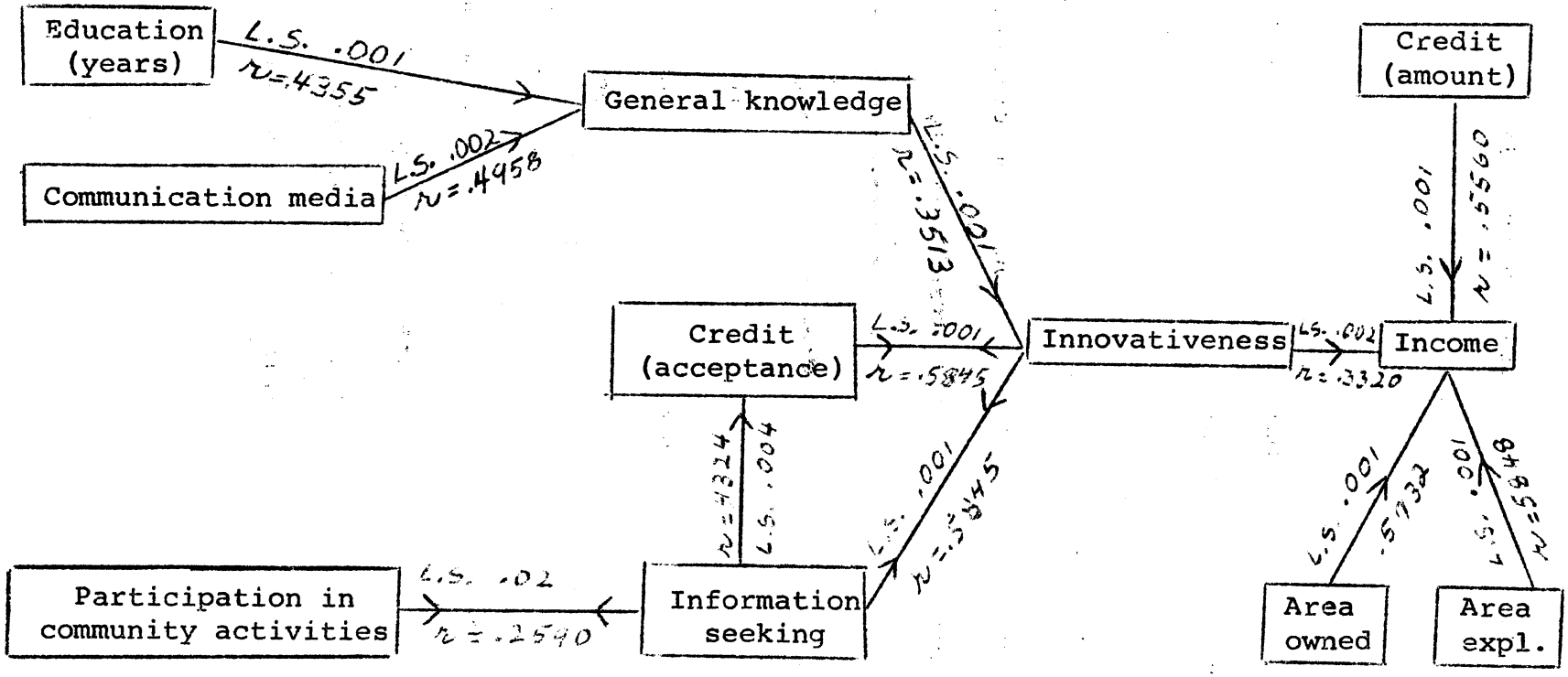
Findings:

The results of the correlational analysis indicated that some of the hypothesized variables were correlated with innovativeness, others were not and some of those variables which were correlated were others than the hypothesized correlates. In fact only income ($r = .33$; $p = .002$) and utilization of credit ($r = .40$; $p = .001$) were significantly correlated with innovativeness.

In view of the obvious inadequacy of the a priori model to describe the relationships which appeared in the analysis, it was decided that an a posteriori should be constructed in an effort to clarify the existent relationships. In this model the same dependent variable is used; in addition to those in the a priori model, the following independent variables were also included: general knowledge, information seeking, amount of credit, area owned, and area exploited. The relationships of these variables resulted in the schema presented in Figure II.

SCHEMA II

An "A Posteriori" Model Summarizing the Relationship Between the Independent and Dependent Variables



In this, the final schema, it can be seen that neither years of formal education, utilization of mass media nor participation in community development programs were directly related to innovativeness. As will be remembered, these three variables were among the hypothesized correlates proposed in the a priori model.

The lack of a significant relationship of education with innovativeness is, in all probability, explained by a combination of factors. In the United States, where most of the studies on which the a priori model was based were done, educational levels are considerably higher and exhibit more within-sample variation. In the Contadero sample, 12 percent of the respondents had no formal education and 75 percent had from one to five years. In addition, if conversations with residents of the area can be relied upon, there is a significant proportion of the people who state, for example, that they have four years of education who, in reality, have spent two years in each of the first two grades, or who have attended sporadically during a four-year period.[8] It is also the case that the traditional government-regulated curricula do not include topics such as vocational agriculture or other farm-related subject matter of a practical nature.[9] The rudiments

of literacy are, however, included and this, it is believed, explains both the moderate relationship ($r = .48$; $p = .002$) found between education and utilization of mass media, the operational measure of which emphasized the frequency of newspaper reading; and the relationship of both of these measures to general knowledge. The operational measure of the latter variable was a series of 12 items relating to political, economic, agricultural, and health aspects of Colombian life. The index was subjected to a Gutman analysis and, after eliminating three of the items, yielded a coefficient of reproducibility of .91.

Utilization of communications media is correlated somewhat more highly ($r = .50$; $p = .002$) with general knowledge than is education ($r = .44$; $p = .001$). These variables explain 25 and 19 percent respectively of the variance in general knowledge. Partial correlations controlling first for education then for mass media use (newspaper reading) resulted in reductions of 45 and 65 percent respectively in the variance in general knowledge explained. This seems to indicate that newspaper reading is somewhat more important than formal education in the acquisition of general knowledge.

Neither education nor utilization of mass media correlates with innovativeness but both are correlated with general knowledge which is, in turn, related to the dependent variable ($r = .35$; $p = .001$).

The variable of participation in community development programs was related to information seeking ($r = .26$; $p = .02$) and the latter variable was related to both credit acceptance ($r = .43$; $p = .004$) and to innovativeness ($r = .58$; $p = .001$). As schema II (the a posteriori model) indicates, neither credit acceptance, nor information seeking, nor innovativeness were related to participation in community development programs. This is quite possibly explained by the fact that cooperative community labor is a part of the traditional normative structure.[10] In this case, even though the traditional "form" contains modern "content" such as working on streets, schools, etc., it would not seem at all improbable that this variable would be an invalid indicator of innovative propensities on the part of participants.

None of the above mentioned independent variables was found to be significantly related to income which, with the amount of credit received, area exploited, and area owned, constituted a cluster. Only area exploited ($r = .32$; $p = .01$)

was related directly to innovativeness; the remaining two variables were highly correlated with income only. Income itself was related to innovativeness though only moderately ($r = .33$; $p = .001$).

Land owned and land exploited are highly interrelated and for this reason it is not surprising that both are rather highly related to income. However partial correlations between innovativeness and credit, income, information seeking, and general knowledge, show that in all cases the relationships are reduced to a greater extent when controlling for area exploited than for area owned. The reduction in variance explained is especially notable when relating innovativeness and income while controlling first for area owned and then for area exploited. The reductions are 39 percent and 66 percent respectively. The remaining variables are less seriously affected by these controls.[11]

In an effort to determine more precisely the total contribution of general knowledge, credit utilization, information seeking, and income to innovativeness, a multiple correlation was calculated which yielded an R^2 of .394 ($R = .628$). Thus, these four variables explained slightly more than 39 percent of the variance in innovativeness.

On the basis of the zero-order correlations, it seems that information seeking is the most explanatory of the several independent variables chosen. This measure was operationalized in the form of three questions asking, in the case of difficulties with animals, crops, or money, whether the individual sought help from a family member (traditional source), a relative (traditional source), a professional in the field (modern source) or an official agency (modern source).

In an effort to specify the relative contribution of these variables, beta weights were calculated[12] using the four independent variables already mentioned and, in addition, the area exploited, which was the only remaining variable directly related to innovativeness. The beta weights indicate "how much change in the dependent variable is produced by a standardized change in one of the independent variables when the others are controlled."[13] These beta weights, when associated with their respective correlations, result in an R^2 of .444 (R = .666). Of this 44 percent of explained variances in innovativeness, the major contribution (as indicated by the beta weights) is being determined by information seeking.

TABLE 1:

The Relationship of Credit, Information Seeking, Income and General Knowledge to Innovativeness while Controlling on Land Owned and Land Exploited.

	Without Control Innovativeness	Controlling for Area Owned Innovativeness	Controlling for Area Exploited Innovativeness
Credit	.3966	.3760	.3677
Information seeking	.5845	.5794	.5584
Income	.3320	.2601	.1946
General Knowledge	.3513	.3225	.3137
	Total Correlation	Partial Correlation	Partial Correlation

TABLE 2:

Selected Correlates of

Innovativeness and Beta Weights

Variables	r	B	Rank according to the explanatory power
Area exploited	.32*	.107	5
Total family income	.33**	.125	4
Credit acceptance	.40**	.130	3
General knowledge	.35**	.175	2
Information seeking	.58**	.441	1

*significant at the .01 level

**significant at the .001 level

$R_1.2345 = .666$ $R_1^2.2345 = .444$

A tabulation of the sources from which the respondents first learned of the practices appearing in the adoption index shows the following frequencies and rank order of frequency for the three subgroups of the index:

TABLE 3:

	Source			
	Saw on another farm	Extension	Word of mouth	Newspaper or radio
1. Gen. Agriculture	1 (133)	3 (39)	2 (100)	4 (6)
2. Cattle	1 (52)	2 (41)	3 (21)	4 (1)
3. Hygiene	2 (116)	1 (125)	3 (50)	4 (9)

In the General Agriculture category, seeing and word of mouth were nearly equally named as sources for lime, chemical fertilizer and weed killer; extension was most important for the latter two items mentioned. Seeing was also important for learning about threshing machine rental. Rates of adoption ranged from 13 (of 90) for use of a harrow to 58 for chemical fertilizer.

Cattle related items were adopted least. Sources cited were generally few as a consequence. Notable exceptions to this were extensive contacts with extension agents with regard to vaccination against foot-and-mouth disease and seeing in the case of iodized block salt. Thirty-one

respondents used the former item and 42 the latter. The remaining items--concentrated feeds, cross-bred cattle, and Merino sheep--were adopted by 6, 5, and 9 persons, respectively.

Extension contacts had greatest use with regard to the hygiene items. The local health center was the source of these contacts. This may have been somewhat of a confounding factor since those who visited the health center (57) would naturally be those most likely to have been vaccinated against small pox (54). Boiled water was used by only 24. Toothbrushes were found in the homes of 49 respondents and 44 used commercially manufactured soap.

Generally speaking word of mouth and seeing accounted for 69.6 percent of the sources cited, extension contacts 29 percent and newspapers and radio, 1.4 percent.

On this basis it seems that if this is a reasonably accurate picture of information sources, then they are overwhelmingly localite. Even those 37 respondents who said they read newspapers do not seem to have used them as a source of information about new farm or health practices. This tends to corroborate earlier comments with regard to the lack of a significant correlation between use of mass media and

innovativeness and at the same time the correlation with the information seeking items which actually accounts only for word of mouth sources.

It is usually the case that when farmers visit the local branch of the government agricultural bank (La Caja Agraria) the loans are made contingent upon compliance with suggestions made by the bank's experts. Another possible source of "forced adoption" is the Bavaria brewery which contracts for and helps finance the growing of barley in the study area. With this arrangement they may exercise some control over type of seeds, fertilizers and other aspects of planting and harvesting. It may also be true that since repayment of loans often depends on a good harvest that there might be a tendency to seek funds from less demanding sources such as family or friends, if the risk involved in using new methods, seeds, or fertilizers insisted upon by the bank or brewrey were perceived to be great.

Summary and Conclusions

At the beginning of the present paper an a priori model of correlates of innovativeness was proposed. This model was based on results of studies of a similar nature carried out virtually exclusively in the United States.

The findings indicated that the model proposed did not adequately describe the relationship existing in the data gathered in the Colombian municipio of Contadero, Nariño. In an attempt to systematize the relationships found, an a posteriori model was developed. Since primary interests centered in the consideration of the correlates of innovativeness, more complete analysis was done on that section of the model.

On the basis of the zero-order correlations, five correlates were chosen which seemed to be the major contributors in explaining variation in innovativeness. These were used as a basis for a multiple correlation which indicated that the five variables considered--total family income, whether or not credit was utilized, general knowledge, information seeking patterns, and area exploited--explained more than 44 percent of the variance in innovativeness. ($R^2 = .444$; $R = .666$).

In an effort to determine the relative contributions of each of the independent variables, beta weights were calculated. It was found that almost one-half of the variance explained was contributed by information seeking patterns, almost one-fifth by general knowledge, aproximately one-tenth by credit acceptance, more than one-tenth by income, and one-tenth by area exploited.

The findings cited above indicate that information seeking contributes substantially to the adoption of innovations. What is it that initiates this activity? It seems logical that an individual must have favorable attitudes toward an improvement of his situation and, in addition, knowledge of the sources available and the ability to utilize them.

The authors believe that one of the most basic and most desirable changes which could be made would be to improve the educational system.[14] This could be done in any one or, preferably, a combination of several ways: 1) more adequate preparation of teachers, 2) an increase in the number of grades taught, 3) more adequate literacy training, and 4) a modification of the traditional curriculum to include vocational agriculture courses.

The last two suggestions would have a great potential for effecting an increase in rates of adoption or, at the very least, an increased awareness of alternatives to present methods and materials.

A further advantage of these reforms would be that at the age at which the individual would be affected, their attitude structure is more likely to be changed (or formed) with less effort than when adults are considered.

With regard to adults, even though there seem to be negative sanctions attached to returning to or beginning school at a relatively "advanced" age, it might be the case that adult classes in vocational agriculture and/or literacy could be successfully implemented.

It should be noted here that previous studies in rural Colombia have found that those individuals with a higher level of education tend to be among the out-migrant group in a given community. Hence, it may be the case that a general increase in the level of education in a community such as Contadero would, in time, lead to the migration of those most highly educated to other, probably urban, areas thus leaving the community in worse condition with regard to education than it was before such educational improvements were made. It

is unfortunate but, nonetheless, true that it would be virtually purely speculative to try to specify directions of causality on the basis of the data cited in this paper. For that reason, it should be made clear that in the final analysis such inferences should be made with caution. An aid in facilitating the determination of such relationships would be the use of longitudinal studies conducted in this type of rural communities.

11. See Table 1.

12. See Table 2 for the beta weights, correlations, and variance explained by each. The beta weights were calculated using Doolittle's method. See Quinn McNemar, Psychological Statistics, New York, John Wiley and Sons, Inc. 1949. pp. 157-60.

13. Hubert M. Blalock, Jr., Social Statistics, New York, McGraw-Hill Book Company, Inc. 1960, p. 345. Italics omitted.

14. For further comments on this aspect of the problem see A. Eugene Havens, Education in Rural Colombia, op. cit.

FOOTNOTES

1. Land Tenure Center Fellow and Doherty Fellow, respectively, Department of Rural Sociology, University of Wisconsin.

2. Eugene Havens, A Review of Factors Related to Innovativeness, Wooster: Ohio Agr. Exp. Sta. Bull. AE 328, 1962.

3. See Eugenio Maffei, Innovativeness as Related to Other Factors in a Colombian Community: Contadero, Nariño. Unpublished M.S. thesis, Madison: The University of Wisconsin, 1966.

4. The authors wish to express their appreciation to the Land Tenure Center for permission to use the data on which the present paper is based, and to Professor A. Eugene Havens for his helpful comments and suggestions.

5. A municipio is a political unit similar to a county.

6. A minga is a type of cooperative farm labor, similar to the threshing teams once common to the United States.

7. Jesús Cano Arango, Geografía Física y Económica de Colombia (5a edición), Cultura Colombiana Ltda., Bogotá, 1964. p. 45.

8. See Robert Lee Whittenbarger, Attitudes Toward Social Change in a Rural Colombian Community: An Attempt at Measurement. Unpublished M.A. thesis, Madison: The University of Wisconsin, 1966. p. 36.

9. A. Eugene Havens, Education in Rural Colombia, Land Tenure Center, University of Wisconsin, February 1965.

10. See Dale W Adams and A. Eugene Havens, The Place of Socio-Economic Research in Developing a Strategy of Change for Rural Communities, Land Tenure Center, University of Wisconsin. p. 20.