

AGENCY FOR INTERNATIONAL DEVELOPMENT
 WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

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Batch # 20

1. SUBJECT CLASSIFICATION	A. PRIMARY Agriculture	AE50-0000-G302	
	B. SECONDARY Rural sociology--Latin America		
2. TITLE AND SUBTITLE Some theoretical and methodological considerations for research on diffusion in the hot-humid tropics of Latin America			
3. AUTHOR(S) Havens, A.E.			
4. DOCUMENT DATE 1965	5. NUMBER OF PAGES 16p.	6. ARC NUMBER ARC	
7. REFERENCE ORGANIZATION NAME AND ADDRESS Wis.			
8. SUPPLEMENTARY NOTES (<i>Sponsoring Organization, Publishers, Availability</i>) (In Land Tenure Center paper no.10)			
9. ABSTRACT			

10. CONTROL NUMBER PN-RAB-228	11. PRICE OF DOCUMENT
12. DESCRIPTORS Acceptability Information theory Land settlement Latin America Technology transfer Tropics	13. PROJECT NUMBER
	14. CONTRACT NUMBER Repas-3 Res.
	15. TYPE OF DOCUMENT

November 1965

LTC No. 10

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

**SOME THEORETICAL AND METHODOLOGICAL CONSIDERATIONS
FOR RESEARCH ON DIFFUSION IN THE HOT-HUMID TROPICS
OF LATIN AMERICA**

BY

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This paper was prepared for presentation at the Conference on the Potentials of the Hot-Humid Tropics in Latin American Rural Development, sponsored by the Cornell Latin American Year, November 29-December 3, 1965.

**SOME THEORETICAL AND METHODOLOGICAL CONSIDERATIONS
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The adoption of new agricultural techniques in the hot-humid tropics of Latin America probably results from a variety of changing conditions. It is the purpose of the present paper to specify some of these conditions, particularly those felt by the author to be most relevant. It is assumed that, as Wilkening stated, "Man constantly controls his behavior in order to control his environment for the attainment of future as well as for the attainment of present goals. This is what most of technological development does. Technology enables man to increase his control over the natural resources and thereby reduce the unpredictability of production. But just as essential as technology for this control is the social organization and the culture composed of supporting ideas, norms and values." 2/ Therefore, the focus of the present paper is upon the social organization that exists or is emerging in the hot-humid tropics of Latin America as it affects the adoption of new techniques.

Previous Studies on Adoption

Research concerning the diffusion of innovations in Latin America is a relatively recent topic of concern. This is not too surprising since empirical sociological and anthropological investigation is a recent occurrence. Although recent, many empirical studies have been conducted on

diffusion in Latin America. 3/ The classic diffusion study in the United States is generally considered to be the Ryan and Gross 4/ study concerning the adoption of hybrid seed corn by Iowa farmers conducted in 1941. Perhaps the classic study in Latin America is that of Deutschmann and Fals Borda. 5/ These studies provide some insights for the present topic.

Diffusion of innovations is generally considered as a decision-making process whereby the individual passes through a series of stages (awareness, information-seeking, evaluation, trial, adoption) which lead to adoption of an innovation. Generally, the individual is considered as the unit of analysis although groups, communities, or even societies could be utilized. The present paper attempts to raise some 1) theoretical, and 2) methodological considerations concerned with how this process functions in Latin America in general and in the hot humid tropics in particular.

First of all, it is essential to recognize that the theoretical formulations concerned with diffusion have been largely based upon U.S. studies. As such, certain assumptions are present in these formulations which may not be appropriate to the Latin American situation. If diffusion is considered as the result of individual decision-making (as it tends to be), then we can consider the diffusion of innovations as the consequence of a particular form of social action. In the majority of social action formulations, choice is considered as axiomatic. 6/ For choice to be considered axiomatic certain conditions must be present. That is, if diffusion is the sum-total of individual choices, the individual must be free to make these choices. If not, either 1) no diffusion is present, or 2) diffusion, in some societies, is the consequence of factors other than individual decision-making.

It would appear as though some of the following prerequisites must exist in order for choice to be axiomatic. First, alternatives must exist and the actor must possess knowledge of alternatives in the decision-making situation. Perfect knowledge, which seldom exists, is not a prerequisite, but some degree of knowledge certainly is before a person can decide to adopt an innovation. 7/ Secondly, we must assume either 1) sufficient capital resources to invest in innovations, or 2) the availability of credit. Obviously a person cannot accept an innovation unless he is able to absorb the cost of the innovations.

Costs of innovations are not always readily converted to a monetary unit. Social costs are also involved -- meaning another prerequisite is needed which is a social climate conducive to change. Social system norms may dictate to the majority of actors within the system the desirability of the innovation. If the innovation is compatible with the existing norms and values, acceptance, all other factors being equal (i.e., availability of cash resources and knowledge), should be accelerated.

Still another factor must be considered. The innovation may threaten the existing power structure. That is, if acceptance of the innovation is perceived by the power holders as a threat to their position, they may repress information about the innovation. Cardona noted that in traditional systems of social organization the relation between the patron and the obrero is so strong that the patron is considered as a possessor of the obrero. 8/ In such a system the possibility exists that the patron enjoys a higher prestige within the organization (say the local community, for example) than outside the system, then "the only potential innovator within the system (the patron) hesitates to accept change since it may bring a rejection of existing relations" 9/

These are a few relevant factors which should be considered in Latin American research on the diffusion of innovations. The majority of Latin American countries are classified on the traditional end of the modernity continuum. As such, it is much more likely that the rate of adoption of innovation may be affected by relatively few factors and individuals. For example, if the patron decides that some innovation should be utilized by his aparceros, the rate of adoption curve for that particular system may be highly accelerated. Simultaneously, a problem is introduced insofar as methodology is concerned. If one attempts to reconstruct the adoption process by talking to the aparceros, he is not studying the decision-maker. It is quite likely that the share-cropper can relate 1) his time of adoption, 2) his perceived reasons for adoption (but not that the patron so dictated) and 3) if he is still using the innovation, etc. However, if this information is utilized to test hypotheses derived from action theory where each individual is free to choose, some misleading results may accrue because the actual decision-maker was not consulted. I have the feeling that too many researchers who are studying diffusion in Latin America overlook the all-important variable of social structure in their studies. 10/

The foregoing discussion, then, is an appeal for more consideration of the nature and type of social relations which exist in Latin America. It is quite possible that the assumptions made by the existing body of theory which pertains to the diffusion of innovations is not appropriate for Latin America. This is particularly true since the majority of diffusion studies tend to assume that choices are infinite in any decision-making situation rather than a finite set selectively perceived by the actor. Hoselitz

stated "a society on a low level of economic development is, therefore, one in which productivity is low because division of labor is little developed, in which the objectives of economic activity are more commonly the maintenance or strengthening of status relations, in which social and geographical mobility is low, and in which the hard cake of custom determines the manner, and often the effects of economic performance." 11/ It would not be surprising if, within this type of social organization, that diffusion follows a different pattern than in highly developed societies.

We should note that, in the majority of Latin American countries, 1) communication patterns are little developed, 2) subsistence farming is paramount coupled with few sources of credit, and 3) the average person finds himself in a subordinate power position. It is highly unlikely that this individual makes many significant management decisions. Effort should be devoted to the advancement of a model for the diffusion of innovations within traditional societies taking into account the unique structural variables which are present. Some studies have indicated that factors related to the adoption of innovations in modern societies are also similarly related in traditional societies. 12/ I do not attempt to negate these studies. Instead, the argument is advanced that although the same variables are statistically related, the causal nexus is somewhat different. This difference should be noted and taken into account in diffusion studies.

The Hot-Humid Tropics

With the previous considerations in mind, let us now focus our attention upon what is happening in the hot-humid tropics. I must confess that I am

not a geographer and have not travelled extensively throughout this region of Latin America. Therefore, the hot-humid tropics as used in this paper generally refers to the Pacific Coastal area of Panama and Colombia, the south-eastern lowlands of Colombia and south-western lowlands of Venezuela, the Amazon basin of Brazil and the eastern lowlands of Peru and Bolivia.

When we look at the population of these geographical areas, we notice immediately that it is sparsely populated with one-third or more of this sparse population concentrated in fairly large urban centers located on major water transportation systems. These large centers are also linked to the other regions of their respective countries by air service. Most of the economic activity centers around a subsistence milpa agriculture, some hunting and gathering and some industrial plants that transform local raw materials into consumer goods for mostly local markets. 13/

However, some changes are occurring. As the population pressures increase in the highlands of these countries (particularly Colombia and Bolivia), spontaneous colonists (i.e., those who are not part of government directed projects) begin to drift into these areas in an attempt to obtain land and find a better living for their family. Because of the lack of adequate census data for the hot-humid areas of these countries, it is difficult to estimate the amount of in-migration. However, when the areas are relatively accessible, there seems to be a fairly varied influx of settlers. For example, in Caquetá, Colombia during a six-month period in 1963 there was a net in-migration of 433 people. It is estimated that an average of 100 new families enter the Caquetá region each month while a considerable number of families are leaving. 14/ There seems to be a similar occurrence in Bolivia, particularly in certain areas such as Chapare and Caranavi.

It might be appropriate to ask what attracts these spontaneous settlers to such areas. Timmermeier's study suggests that it is a combination of push and pull factors with the pull factors largely centering around availability of land and possibilities of changing living patterns. ^{15/} As such, one might speculate that those who are willing to venture forth to these new areas may have a larger tolerance for risk than those who stay behind. On the other hand, they may feel that the risks are no greater in the hot-humid tropics than in the highlands where land pressures are greatly increasing or rural violence is still present. Both the Timmermeier study ^{16/} and Patch's study of Santa Cruz, Chapare and Caramoni in Bolivia ^{17/} indicate that a large proportion of the settlers they studied were influenced to move by friends or relatives already in the area. Thus, the second wave of migrants may have felt some carry-over of security being provided by the family. At any event, some parts of the hot-humid tropics are being settled by spontaneous colonists.

The early settlement pattern seems to be a combination of line villages and scattered farmsteads with most of the line villages following the major transportation routes. At this stage of settlement, the major concern is with clearing enough land to provide subsistence for the family. Early agricultural techniques that are adopted tend to follow tried and true patterns used by the Indians or early settlers. Since the crops and soils are different from the highlands, new settlers prefer to adopt practices that will assure sufficient food for the family. Early settlers of the rain forests in Choco, Colombia, for example, almost totally adopted the technique of production that the Indians in the region had developed.

After subsistence for the family is provided, more land is cleared and concern is then generated for the marketing of crops and increasing productivity above subsistence levels. At this stage of evolution, the model of decision-making based upon the individual choosing among alternatives is somewhat appropriate since the farmer is, in part, the decision-maker for his farm unit. For example, Tinnefmeier concluded that almost all farms in Caqueta were owner-operated in terms of decision-making even though title security was not always present. ^{18/} Apparently, at this stage of evolution the farmer in the hot-humid tropics is free to choose among alternative sets of agricultural techniques assuming that the appropriate techniques have been developed and he knows about them. This directs our attention to sources of communication available to the settler.

Communication Sources

Obviously, before a person can adopt a new agricultural practice, he must know it exists. Moreover, the information he receives about the new practice must be sufficient to alleviate his fears of uncertainty of outcome. Due to the close margin most of these farmers operate with, coupled with their low level of capital reserves to absorb a large loss, they tend to delay trial of a new practice until they are quite sure of the outcome. ^{19/} Unfortunately, there appears to be a serious lack of communication sources about new agricultural practices that are relevant to the hot-humid tropics at this stage of their development.

An example of this was found in the Caquetá study. Over seventy-five percent of the spontaneous settlers reported no sources of information about new agricultural practices. This does not mean that sources were absent

but that they provided no useful information. The relationship between use of communication sources and adoption was not significant. This does not mean that communication media is unimportant in this region. It merely reflects the irrelevancy of its content.

Agricultural extension or its counterpart is apparently no better. Timmerman summarizes its relevance in the following manner, "The spontaneous settlers had little or no contact with extension or other technical workers. The extension agents in the colonization projects were available but ineffective -- the farmers knew more about the agriculture of the region than did the agents." 20/

A final point on communication concerns itself with source credibility. In Colombia, for example, most rural people seriously distrust government agents. Therefore, information about new practices that stems from governmental sources tends to lack credibility. Under these conditions, it might be wise to use non-governmental sources as much as possible or else governmental sources, such as the Caja Agraria and extension services, must redouble their efforts if they make much impact.

Credit Resources

It is fairly clear that capital reserves of the settlers in the hot-humid tropics are almost nil for the vast majority. As a result, innovations in agriculture either must be very low cost (and hopefully low risk and socially compatible) or else adequate credit must be available if the innovation is to be adopted.

Credit sources tend to center around friends, prestamistas, merchants and the Agricultural Banks. Apparently, one of the major shortcomings

of the available credit sources is that only short-term loans are available. When long-term loans are made, they tend to require a repayment schedule that starts one year after the loan. This limits the service to those farmers already with some cash reserves so that the first-year repayment can be made. A poor farmer, hoping to build up a palm oil enterprise, for example, cannot begin to pay the first year since it takes four years until the first harvest and he usually has few other sources of income. The non-official sources of credit, such as the prestamistas and merchants, tend to have a more realistic repayment policy but the amount of credit is severely limited.

Another problem that relates to the acquisition of credit is title security. Most official sources of credit, such as the agricultural banks, generally require land titles as security for the loan. The settler is not always able to obtain a title even if the land he is exploiting is public domain. These states the general problem in the following manner, "The exploitation of farms without secure titles may produce serious economic and social repercussions. For example, it hinders an adequate exploitation of the land by burdening the title-less producer with problems in obtaining credit and water concessions, possible involvement in eviction litigation, and severe restrictions in commercially dealing with the property in question." 21/

In looking at the problem specifically relating to colonization in the hot-humid tropics of Colombia, he notes, "Similarly, while colonos have long had the privilege to obtain, free of charge, titles to the public domain lands they have settled, the distribution of these titles has in

the past been very poorly administered. The colonos had to incur relatively large expenses to obtain their titles. Not understanding the procedure involved, they have often been exploited by private tituladores who charge a fee for undertaking the transactions involved and pocket the money without providing any services. Furthermore, influential landowners are still driving out colonos from public domain lands." Thus, title insecurity affects the chances of being able to obtain certain types of loans.

To summarize this section, two stages of the evolution of settlement of the hot-humid tropics have been suggested. The first stage is the opening of the lands when primary concern centers around land clearing and providing subsistence to the family. After this stage, the settlers are concerned with increasing production and marketing products. They appear ready to adopt innovations and they are capable of taking their own decisions. At this point, the adoption model which assumes individual choice among rational alternatives might be appropriate but two limiting factors generally seem to be present. These are 1) lack of information, and 2) lack of available credit for expansion.

Later Structural Changes

As the early colonization centers develop, some structural changes tend to occur. When production increases above the subsistence needs, markets for these products are needed. Initially, most surplus products are sold locally and a community emerges which is largely self-sufficient. Later on, the local market cannot absorb the products so ties with more nationally-based markets are attempted, notwithstanding the severe

transportation problems. However, this does not imply that all the colonos have risen above the subsistence level. Some of them have and these tend to be those with the most communication contacts, the more risk tolerant, and those with more cash reserves who could enter into long-term development loans. The others become discouraged and are more willing to sell or abandon their clearing for what appears to be better opportunities.

The more economically advantaged may buy their clearings at low rates. Others that are highly debt-hurdened to local prestamistas or merchants become a source of labor for those who have increased their holdings to such a size that the family can no longer supply sufficient amounts of labor. In some cases, those that increase their holdings adopt capital-intensive, labor-saving practices. Those less advantaged can be expected to attempt to continue to adopt labor-intensive, capital-saving practices. But the two do not mix satisfactorily. As other families leave, thus decreasing the possibility of brazo prestado and as older sons enter the army, for example, and never return, labor prices increase thus placing the small, subsistence colono in a more difficult position. The result is the emergence of a latifundio-minifundio form of tenure arrangements and we have now returned to the initial considerations with which we started.

Thome explains the process as follows, "In addition, a minifundio-latifundio pattern appears to be developing in the colonization areas. Due to the almost insuperable hardships they face, colonos often have to abandon their holdings, or sell them to a more prosperous neighbor, after only a few years of exploitation. They clear the land, but the benefits are reaped by those who can afford a long-term investment. Many of the

larger holdings in the Llanos have been formed through this process. If this development is to be halted, colonos must be given security over their holdings. This means not only a title, but adequate credit facilities and access to markets." 23/

Summary

In summary, the central argument of the present paper is that past studies concerning the use of new agricultural techniques have largely overlooked the structural arrangements within which adoption occurs. Therefore, they have not always proved helpful. If one looks at the structural evolution that occurs in the colonization and settlement of the hot-humid tropics, four fairly clear stages emerge. These are: 1) early settlement and clearing, 2) satisfaction of subsistence needs are met and there exists a normative and value structure supporting the adopting of new techniques but other necessary conditions are lacking, 3) the transition period which is typified by rapid change-over of land holdings and out-migration, and 4) consolidation of cleared lands into large holdings which eventuates in latifundio and dependent minifundio.

The best stage for breaking the pattern is stage two, assuming the techniques exist that are appropriate to the hot-humid tropics. The selection of this stage as the best stage may represent a cultural bias on the part of a person who has studied the adoption of innovations in the United States because the structural conditions fit the model of adoption with which we are accustomed. It may also fit reality because we are frequently being called upon for technical assistance and, therefore, we should lead from our strongest suit.

FOOTNOTES

1/ Assistant Professor, Rural Sociology, University of Wisconsin. The present paper draws largely upon research done in Latin America by the Land Tenure Center, with which the author is affiliated. The views presented herein are those of the author and not necessarily those of the Land Tenure Center.

2/ Eugene A. Wilkening, "Some Perspectives of Change in Rural Societies," Rural Sociology, Vol. 29, pp. 1-13, 1964.

3/ c.f. Paul Deutschmann and Orlando Fals Borda, Communication and Adoption Patterns in an Andean Village, San José, Costa Rica: Programa Interamericano de Información Popular, 1962; Paul Deutschmann and A. Eugene Havens, "Discontinuances: A Relatively Uninvestigated Aspect of Diffusion", Rural Sociology, submitted; A. Eugene Havens, "La Adopción de Innovaciones: Una Comparación entre Colombia y Estados Unidos", Memoria del Primer Congreso Nacional de Sociología, Bogotá, Colombia, Editorial Iqueima, 1963, pp. 71-85; Facultad de Sociología, Factores sociales que inciden en el desarrollo económico de la hoya del río Subachoque, Bogotá, Universidad Nacional de Colombia, 1963; and also see the recent studies in Rio Grande do Sul by Fliegel and Haller.

4/ Bryce Ryan and Neal Gross, "The Diffusion of Hybrid Seed Corn in Two Iowa Communities," Rural Sociology, Vol 8, pp. 15-24, 1943.

5/ Deutschmann and Fals Borda, op. cit.

6/ Talcott Parsons and Edward Shils, Toward A General Theory of Action, Cambridge, Harvard University Press, 1951.

7/ See Glenn Johnson and Cecil Haver, Decision-Making Principles in Farm Management, Lexington, Kentucky Agricultural Experiment Station Bulletin 593, January, 1953.

8/ Ramiro Cardona Gutierrez, Organización de la Producción Agrícola: Dinámica de Cambio, Santiago, Chile, FLACSO, 1963 (pages not numbered).

9/ Ibid.

10/ For example, in the study of Deutschmann and Fals Borda one can plainly see the effect of the power structure on rate of adoption curves.

11/ Bert F. Hoselitz, Sociological Aspects of Economic Growth, New York, The Free Press of Glencoe, 1960, p. 60.

12/ See Deutschmann and Fals Borda, op. cit.; and Havens, op. cit.

13/ c.f. Serviço Nacional de Recenseamento, Sinopse Preliminar de Censo Agrícola, Rio de Janeiro, 1963, and Censo Industrial, Aspectos Gerais, Rio de Janeiro, 1963. (Particularly the States of Amazonas and Pará).

14/ Ronald L. Tinneermeier, New Land Settlement in the Eastern Lowlands of Colombia, unpublished Ph.D. thesis, University of Wisconsin, 1964, p. 35.

15/ Ibid., p. 57.

16/ Ibid., p. 58.

17/ Richard Patch, Estudios de Colonización en Bolivia, Vol. 1, La Paz, Bolivia, 1962, p. 49.

18/ Tinneermeier, op. cit., p. 230.

19/ For a discussion of these points see Delbert T. Myren, "The Role of Information in Farm Decisions Under Conditions of High Risk and Uncertainty," Communications in Agricultural Development, First Inter-American Research Symposium, Mexico City, 1964, pp. 94-100.

20/ Tinneermeier, op. cit., p. 233.

21/ Joseph R. Thome, "Title Problems in Rural Areas of Colombia: A Colonization Example," Centro Interamericano de Reforma Agraria Mimeografiado No. 3, Bogotá, Colombia, 1965, p. 1.

22/ Ibid., p. 6.

23/ Ibid., p. 15.