


1976

Communication of innovations in a highland Guatemalan community

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CAMERON, Lee Duncan, 1946-
COMMUNICATION OF INNOVATIONS IN A
HIGHLAND GUATEMALAN COMMUNITY.

Iowa State University, Ph.D., 1976
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Communication of innovations in a
highland Guatemalan community

by

Lee Duncan Cameron

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of

DOCTOR OF PHILOSOPHY

Department: Professional Studies
Major: Education (Adult and Extension Education)

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

For the Major Department

Signature was redacted for privacy.

For the Graduate College

Iowa State University
Ames, Iowa

1976

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INTRODUCTION

Professional development workers agree that much of the hardware and agricultural techniques which are appropriate to various Third World situations are underutilized--highland Guatemala is a case in point. Birth rates are high, and even in the so-called underdeveloped countries people are living longer. The problem of hunger is but one ramification of the world's present demographic reality. In efforts to prevent and assuage hunger, the so-called First World nations have devoted vast resources to the development of agricultural technology for use in the Third World. Despite the increasing appropriateness¹ of this technology in terms of its usefulness and potential abroad, much of it is not taken advantage of by the people for whom the technology was intended.

It has become increasingly clear that a much more thorough understanding of the communication of these innovations is necessary. There is no benefit derived when appropriate technology goes unused; because this situation exists in many developing nations, concerned world citizens must devote more attention to an understanding of technology diffusion. An example: San Marceno hybrid corn was developed

¹See definition of appropriate or intermediate technology under the sub-head Definitions, this chapter.

in the 1960's especially for the volcanic soils of western highland Guatemala. Yet, this highly productive, disease resistant strain was never used by thousands of peasant farmers. Given the highland farmer's propensity toward agricultural experimentation (Tax 1972:130), why has San Marceno seed been largely ignored? Why has other technology (e.g., bus and truck transportation; the treadle loom and wheat cultivation, both introduced by the Spanish) been accepted? It is clear that the development of appropriate technology is only half the struggle; the other half is utilization of that technology so that maximum benefit can be derived.

In Nahuala, Guatemala, radio station La Voz de Nahuala (here often referred to by its call letters, TGVN) has promoted the diffusion of non-traditional technology among two indigenous highland Guatemalan peoples, the Quiche and the Cakchiquel Indians. The present researcher, in collaboration with the TGVN staff, examined some aspects of agricultural information communication in an indigenous community. TGVN is not the only source of agricultural information in that target area; however, due to its presence in the community particular attention must be paid to this educational radio station.

Purpose

This dissertation will explore aspects of the diffusion of agricultural techniques and information among peasant farmers in one western highland Guatemalan community. Specifically, the present work will closely examine channels and sources of communication with regard to three agricultural innovations in canton Xepatuj, near Nahuala, Guatemala.

Guatemala

Guatemala: geography

Guatemala is a land of geographical diversity. A Central American republic approximately the size of Ohio, Guatemala includes high mountainous regions, a volcanic range traversing the nation from west to east, coastal plains, high plateaus, tropical jungle, and a hot arid zone. This variety of landscapes in addition to the wide range of climates and soil types makes possible the cultivation of many agricultural products.

The republic's 22 departments may be grouped into three major topographical regions: the Pacific Coast, the Peten, and the Central Highlands. The locus of the present study lies within this Central region--the altiplano.

The altiplano is a high plain between the Sierra Madre and Cuchumatane mountain ranges. Maya Indians, constituting

43 per cent of the national population¹, live primarily in this region. These peoples, speaking over 20 closely-related languages of the Maya-Quiche language family, once formed a part of the magnificent Mayan empire.

During their Classic Period, the Mayas reached a high level of perfection in the arts and sciences: ceramics, weaving, agriculture, and perhaps most notably in architecture, sculpture, and mathematics. They had a system of hieroglyphic writing, and a numbering system which utilized the concept zero. The Maya were also knowledgeable astronomers and invented a 365-day calendar.

Guatemala: the highlands in crisis

Today the highland Maya are subsistence farmers whose way of life is threatened by persistent problems. The nation's rate of population growth is 3.1 per cent, among the highest in the world, and the population is most concentrated (over 100 persons per square kilometer) on the altiplano. Population density in this area is expected to increase still more in the years ahead (Fletcher et al. 1970:15).

Population growth has caused a reduction in farm size.

¹Ladinos account for the remaining 57 per cent. Ladinos are those Guatemalans who have adopted the characteristic features of western culture. It is important to note that Indians can become Ladinos by giving up the traditional Maya dress and language in favor of the Spanish language and western-style clothing, by bearing a Spanish surname, and by adopting the ways of life of the Ladinos.

Indeed, according to Fletcher et al. (1970:61) between 1950 and 1964 the average small farm size decreased by almost 50 per cent in the highlands. Thus, parcels of land, traditionally divided by a father among his sons, are becoming increasingly smaller. In addition, the soil is exhausted and often eroded after centuries of cultivation and inadequate land conservation. People are forced to cultivate land which was once undesirable:

Slopes of 45 degrees are regularly cultivated in Huehuetenango, and I observed plots so steep that the farmer had to lash himself to trees before cultivating the corn. Even an animal-drawn plow cannot be used on such terrain (Applebaum 1966:130).

Farming methods in the highlands are rooted in tradition. The Indian farmers use the axe and machete to clear the land, and the hoe both to turn the soil and make the furrows for planting. In some areas, the ancient planting stick is used to make single holes for the seeds. Animal or mechanical sources of power are seldom utilized by the highland Indian farmer; nor does he customarily use improved seed, preferring to select next year's seed from this year's crop.

Corn, domesticated by the Maya some 4500 years ago, is the staple food in a meager diet. However, because of the population problem with the resulting land shortage and exhausted soil, corn production is decreasing--a trend first

noted at least 40 years ago¹ (Early 1973:229). Corn, the subsistence farmer's most important crop, and the crop to which most of his land is devoted, has been declining in yield over a period of years. Many people can no longer grow enough to meet their own family needs. Early (1973:222) writes that between 89 and 99 per cent of the households in the town of Santiago Atitlan are no longer self-sufficient with regard to corn.

Thus it is seen that in the Central region land is dwindling in availability and decreasing in production. Applebaum (1966:123) indicates that in the highlands as a whole only 20 to 30 per cent of the Mayas have sufficient land to produce all necessary food for their families. According to Schmid (1967:7-8), three hectares of land is the minimum amount on which a family can subsist without other sources of income, but 61 per cent of the respondents in his study (who were all migrant laborers from the highlands) cultivated less than one hectare. If highland Maya have so little land and such poor production, how do they sustain themselves?

The answer is that most Maya find other work in addition

¹Fletcher et al. (1970:43) write that for four of the central region departments, "total corn output fell from 102,856 metric tons in 1960-61 to 88,826 metric tons in 1965-66, and to 89,148 metric tons in 1966-67." See Applebaum (1966) regarding decreasing yields in Huehuetenango.

to their own too-small farms. Cottage industry provides one opportunity for artisans to sell their products to other Indians and/or to tourists. For example, Indians throughout the highlands produce a variety of brightly colored woven goods. In addition there is some subregional specialization: blankets are woven in Momostenango, grinding stones are crafted in Nahuala, glazed ceramics are made in Totonicapan. Secondly, a man or his sons can sometimes find work in the fields of a Maya neighbor who possesses more land. Wages are low, varying between 30 and 50 cents per day, and sometimes include the noon meal (Gobierno de Guatemala 1968:36).

A third alternative is to find employment as a migrant worker in the piedmont or the Pacific coastal plain. Here the peasant can rent farmland or he can work as a seasonal laborer on one of the large coffee, cotton, or sugarcane plantations. Schmid (1967:1) estimated the number of these migratory workers in 1965-66 between 200,000 and 250,000¹. Highland Indians are descending to the lowlands in large numbers.

De Paz and Aguilar (1975:1) estimate that annual per capita income in the highlands is US \$50. Schmid suggests, however, that the annual per capita income of seasonal

¹Another estimate is 400,000 migrants per year (Gobierno de Guatemala 1968:36).

migrants is slightly higher than that of the non-migrating Maya farmer. The average migrant wage is approximately one dollar per day, of which the migrant returns to his highland community with somewhere between 18 and 53 per cent (Schmid 1967:27-28). Regarding migrant wages, Schmid (1967:37) concludes:

Wage rates [for migratory laborers on the large plantations] were two and one-half to four times as high as daily earnings on the home farm. They were two to three times as high as wages for agricultural work in the home communities, and 50 to 100 per cent higher than for non-agricultural work in the home communities.

Conditions on the large plantations are unpleasant, often unhealthy. Although the plantation owners provide housing for the migrants, Schmid (1967:18) indicates that most owners simply erect steel roofs over the bare ground; he also cites the case of one plantation where thousands of workers were without shelter altogether. Migrants may make \$1 a day, but of that they have to spend at least 32¢ on food, which may well be of low quality (Schmid 1967:27). Health is another important factor, and, besides intestinal parasites, dysentery, and poor nutrition, the highlanders encounter health threats such as malaria and insecticide poisoning, dangers which do not exist in the mountains (Oehler 1971:182).

In spite of the realities of plantation life, many Maya Indians have little choice but to seek seasonal work due to

the acute population/land pressures in the highlands. Nevertheless, the long-range forecast regarding work for migratory laborers is gloomy:

The prospects for increased demand for migratory workers on coffee, cotton, and sugar farms in the South appear bleak, given the limited world demand for these export crops and the trend towards mechanization in cotton production. The consequences of a leveling-off or decline in the employment alternatives for the traditional subsector could be extremely serious (Fletcher et al. 1970:51).

In sum, the Guatemalan highland Indians, descendents of the once-great Mayan empire, are today barely subsistence farmers. As the population continues to increase, land becomes more scarce; agriculture becomes more intensive, exhausting the soil. Many Maya, in an effort to survive, have sought seasonal work on cotton, coffee, and sugar plantations in the piedmont and the Pacific coastal plain. However, due to a limited world demand for these products and increased mechanization, the availability of such work may be expected to decrease in the years ahead.

The municipality of Nahuala

The highland departments are subdivided into municipios, somewhat analogous to counties in the United States. Among the highland Indians, the municipio is a distinctive ethnic unit. Typical dress varies between municipios, as do speech characteristics. According to Tax (1937) these dialect

differences are often sufficient to render understanding difficult.

Nahuala is the municipio of the present study. As is often true in the highlands, the municipio's chief town, which is roughly analogous to the county seat, bears the same name as the municipio. Thus, in this case, the chief town is called Nahuala. Unless otherwise specified, all subsequent remarks will pertain to the municipality of Nahuala.

Nahuala is a town of 1,000 located in the western highlands of Guatemala about halfway between Guatemala City and the Mexican border. The Indian community elects a mayor who also serves as a kind of justice of the peace. All other significant public officials are Ladinos and are appointed by the departmental governor. Besides the secretary, the senior official, there are the town treasurer, chief of police, and telegrapher¹.

Nahuala is the focal point of activity for the entire municipio, and its numbers swell on Thursdays and Sundays, the market days. On these days one can purchase staple goods as well as products which are ordinarily unavailable on other days: clothing, sandals, hardware and farm implements (e.g., nails, hoes, or machetes), vegetables, metal and plastic

¹Since there is no telephone service to Nahuala, all outside communication must be either by telegraph or letter.

receptacles, bread, or perhaps a few ounces of meat. The unavailability of many items during the rest of the week is related to the subregional specialization mentioned earlier: sandals and pottery are made in Totonicapan; blankets in Momostenango; beef raised in Retalhuleo. Sellers of these goods travel throughout the highlands visiting towns only on their market days, when the number of potential buyers is at a maximum.

Of course some goods produced locally are also sold at market as well, although they can be purchased from the craftsmen at any time. For this reason, these artisans do not always display their wares on market days, and prospective buyers can visit them at their homes. Nahuala is noted for its piedras de moler (grinding stones), used to process corn, spices and roasted coffee beans, and it is only here that rock suitable for these implements is quarried. Nahuala is also known for its weaving, and in many of the satellite communities, called cantones, practically every family has a treadle loom operated by the men. These weavers produce cotton fabric for women's skirts and huipiles (a kind of blouse) and men's shirts, as well as wool fabric for the men's cotonos (heavy pull-over shirts) and rodilleras (kilt-like garments). Women, too, using the backstrap loom, produce a wide variety of woven goods. In Nahuala, one also finds local mask makers, whipmakers, candlestick makers,

furniture makers, bakers, and distillers of bootleg liquor.

Since Nahuala can be reached by trucks and buses, necessary transportation services can be secured here. Most of the settlements in the municipio are reached only by riding horseback or walking along narrow footpaths. Hence, goods bound for other parts of the republic must first be transported to Nahuala where they can be loaded onto trucks or buses. Common cargoes include lumber and hand-crafted furniture brought in for transport from the hinterlands.

The town offers a number of services not found in the cantones (rural suburbs) or elsewhere in the municipio. Nahuala is unique among highland municipalities in that it has three health clinics, two of which have doctors who reside in town. The community also has a dentist, a student performing her required year of internship in a rural area. However, a great many indigenous people choose not to avail themselves of these medical and dental services, preferring the more traditional health care offered by Indian practitioners in the community. Two schools, one parochial and the other a government-supported public facility, offer childhood education through the sixth grade. The radio schools for adults, to be discussed shortly, provide education in the cantones themselves (and even in other departments)--quite in contrast to most services which are available only in the town.

Several agencies provide agricultural services. The local educational radio station, La Voz de Nahuala (TGVN), has provided agricultural services since 1962 in the form of broadcasts, lectures, and demonstrations. Since 1969 the station has also sold fertilizer. Several TGVN employees have participated in agricultural courses offered by World Neighbors (Vecinos Mundiales) in Chimaltenango. Between 1966 and 1969 the now defunct Nahuala Cooperative sold chemical fertilizer and offered agricultural credit to its members. It also collaborated with the nearby, well-known Novillero Cooperative, a practice which the educational radio station continues. The Novillero Co-op offers logistical support as well as consultation opportunities with its full-time staff agronomists. Finally, for the past several years, government agronomists from INTECAP have annually been offering short courses both in Nahuala and in canton Xepatuj.

Usual fare in the Indians' diet is corn, beans, and coffee. Each farm family plants both corn and beans, although as indicated earlier, few are self-sufficient in either. A small number of migratory laborers grows coffee on rented lands to the south. Some variation in the diet is provided by occasional eggs, potatoes, unleavened wheat biscuits, and small portions of meat. Fresh milk is locally unavailable. Incaparina, a protein-rich powder marketed by the Nutrition Institute of Central America and Panama (INCAP), is available

locally; however, it is not particularly popular among the indigenous people¹.

Because of the population, land and food problems, many Nahualenos (people from Nahuala) migrate to the south for the coffee, cotton, and sugar cane harvests. The peak migration months appear to be November through February (Gobierno de Guatemala 1969:44). During this period of time, contractors from the community recruit Nahualenos to help harvest these crops in the southern lowlands. Most Indians contract for 30 days at a time (Schmid 1967:15). The contractor provides the workers with an advance payment, usually between two and five dollars, given in anticipation of his working on the plantation. This money, later deducted from the worker's wages, is used to buy food, pay for transportation to the lowlands, or to leave with his family if they must remain in Nahuala.

The actual research for this dissertation was carried out in canton Xepatuj, a small settlement just outside of the town of Nahuala. Residents of Xepatuj regard themselves as Nahualenos and are very much part of the greater-Nahuala community.

¹Orr (1972:51) has also suggested that Incaparina may not be reaching the very poor in Guatemala.

La Voz de Nahuala (TGVN)

La Voz de Nahuala (TGVN) is an educational radio station located in Nahuala, Guatemala. TGVN, a Catholic missionary project, is dedicated to enhancing the education of Guatemalan Indians and is completely staffed by indigenous men who both compose much of the educational material and present it on the air. Although Spanish is Guatemala's official language, much of the indigenous population is monolingual, speaking one of the nation's 18 Mayan tongues. Because of this linguistic diversity, TGVN presents educational materials in the two local Indian languages, Quiche and Cakchiquel, on alternate days.

The radio's educational emphasis centers around a core curriculum of literacy, mathematics, health, and agriculture. There are three instructional levels, the first of which is to teach students to read in their mother tongue. The second level emphasizes reading and writing in Spanish. The third and final level is somewhat more comprehensive than level two and includes Spanish grammar, history, and science. Completing level three is equivalent to finishing the second grade in a Guatemalan public school.

Agricultural and other educational programs are transmitted from the studio in Nahuala. These programs are aired in radio schools located within a forty mile radius of the transmitter. Non-student listeners can also tune in TGVN

on private receivers, of course. The setting of a radio school is usually a peasant's dwelling. Each radio school has one volunteer monitor and is equipped with a radio receiver, lantern, blackboard, reading charts, and reading materials, all supplied by TGVN. Prior to the evening broadcast time, the students leave their homes and fields and assemble at the radio school for the broadcast.

Agricultural broadcasts are presented twice daily during the school year in both the Quiche and Cakchiquel languages. The first transmission is in the early morning; agricultural information, interspersed with music, comprises the thirty minute program. A fifteen minute broadcast is made in the evening and is listened to by all radio school students. These two programs together account for the 45 minutes of daily agricultural programming during the school year.

The following topics are among those which have been stressed for the past several years on the agricultural broadcasts:

1. Composting and applying organic fertilizers
2. Applying chemical fertilizers
3. Understanding a soil analysis
4. Understanding soil composition
5. Soil erosion
6. Raising chickens
7. Applying insecticides

In addition, certain radio staff members perform an agricultural extension function in the community. In years past the station has sponsored fertilizer demonstration plots and mounted an extensive fertilizer campaign from 1969 until 1973. Since 1969, TGVN has made fertilizer locally available. In addition, staff members have given public lectures in various locales on a variety of agricultural topics. TGVN is presently encouraging farmers to grow fruit trees, which the staff believes are ideally suited to the area. As has been customary of TGVN agricultural campaigns, the station will sell the saplings at a nominal cost.

Objectives

In the absence of either communication or diffusion studies undertaken among highland Guatemalan peasant farmers, this research should be viewed as exploratory in nature.

The objective of this research is to gather descriptive data on the various channels and sources of agricultural information available to at least some Xepatuj farmers.

The objective will be carried out in part by interviewing the entire population of farming heads of household in Xepatuj, near Nahuala, Guatemala. Techniques of survey research will be utilized.

The data will be subjected to a factor analysis in order to reduce the large number of variables to their common factor patterns.

Delimitations

This research is limited to 146 respondents. Although teams of interviewers desired to contact all heads of farm households in the community (approximately 160), unforeseen circumstances forced a reduction to 146.

Because all interviews were carried out in one community, the research results are not necessarily generalizable to other highland Guatemalan communities.

Definition of Terms

Because of the ambiguity of language, it is necessary to make certain key words more precise:

Farmers or heads of household, the survey respondents, are those people who make the agricultural decisions regarding the land (e.g., what to plant, when to plant, when to reap, etc.) They may be either male or female, although males comprise the overwhelming majority of decision makers in the present research. Farmers or heads of household may be owners, renters, or borrowers of land. They may also farm communally held land. However, these people make the agricultural decisions pertaining to the use of the land.

E. F. Schumacher introduced the terms appropriate or intermediate technology. In Small Is Beautiful, he suggests that appropriate technology implies machinery which, in work output and complexity, is somewhere between the hoe and the tractor.

Intermediate technology refers to the production of basic tools appropriate to local conditions. Such machines are usually straightforward in design and can be repaired with simple tools because they were built with simple tools. In substance, appropriate (intermediate) technology is intended to increase the peasant farmer's productivity through tools which are simple to make and easy to repair.

REVIEW OF THE LITERATURE

The purpose of this chapter is to discuss five topics with regard to the current literature: the adoption process; communication channels; empirical communication channel research in Latin America; radio listening groups and radio forums; and the radiophonic schools of Latin America.

The Adoption Process

Although this topic is only indirectly related to my major emphasis (i.e., communication channels and sources), I treat it first because of its prominent relationship to communication channel research to date. An understanding of the adoption process would, therefore, be useful prior to my discussion of communication channels and particularly to the following topic, channel research in Latin America.

This section contains a brief explanation of the adoption process, a decision making model which was developed by rural sociologists in the United States and later applied in other nations, including several in Latin America. In view of its rather widespread acceptance, a major purpose here will be to present the viewpoints of authors questioning the model's efficacy.

The five stages of the adoption process are as follows (Klonglan et al. 1967:13-14):

Awareness stage: The individual is initially exposed to the innovation but lacks detailed information about it.

Information stage: The individual becomes interested in the innovation and seeks more information about it. In this stage, he seeks both general and more specific information about the intrinsic qualities of the innovation and relates this information to his past experiences and knowledge. He is building up a data base which will help him to decide whether or not he wishes to become further involved with the innovation.

Evaluation stage: At this stage the individual is concerned with applying the innovation to his own situation. The advantages and disadvantages of the innovation relative to other alternatives are considered. The individual makes a decision either to try it or not.

Trial stage: The individual is motivated to use the innovation on a small scale in order to determine its utility in his own situation.

Adoption stage: The individual adopts the innovation and decides for full use. At this point in time, the individual is satisfied that he has chosen an appropriate course of action.

Although originally developed to explain the innovation decision process in the Midwest, the five stage model has been applied in various nations (Rogers 1962; Rogers with Svenning 1969; Rogers et al. 1971). Like their colleagues working in the United States, social scientists performing

research in other cultures have often utilized this model to help explain the diffusion of agricultural innovations.

Critics believe that the model oversimplifies the complex process of human decision making. Rejection of an innovation (i.e., failure to adopt) is not provided for. Furthermore, this kind of a linear model is altogether too restrictive. It implies that decision makers pass through the five stages in sequence and always arrive at adoption. I shall illustrate the linear adoption process model with regard to chemical fertilizer (an innovation) in Guatemala. The model suggests that a peasant will first become aware that fertilizer exists; his interest is then aroused (information); he mulls over in his mind the pros and cons of trying it (evaluation) and then applies fertilizer on a small scale (trial). After a successful trial, the peasant moves into full scale use (adoption).

It is conceivable, however, that a decision maker could deviate considerably from this model. Consider the hypothetical case of a peasant who had never heard of fertilizer until his brother-in-law from another village gave him enough for a small trial with perhaps seven or eight corn plants. Thus, the peasant has gone directly from awareness to trial, bypassing the stages of knowledge and evaluation--at least for the time being. The model as conceived, however, assumes that individuals enter the process at awareness and

proceed through each of the remaining stages in order.

Deutschmann and Fals Borda (1962a:20-21) found that most peasant farmers in Saucio, Colombia, were by-passing the trial stage¹. In other words most farmers went into "full use" of an innovation without a test. Fals Borda (Deutschmann and Fals Borda 1962a:22) speculates that Colombian peasants tend to accept and immediately act upon information from what they define as an authoritative source. The same may not hold true for Iowa farmers. Thus, he argues that there are definite cultural differences between the United States and Colombia and that one should not necessarily expect the adoption process model to transfer en toto from one culture to another.

Rahim (cited by Rogers with Svenning 1969:30), like Deutschmann and Fals Borda found that his Pakistani respondents tended to adopt farm innovations without first trying them on a limited scale. He posits that a trial might be impractical among farmers with very small land holdings, "partially because of the inconvenience of planting, cultivating, and harvesting on such a diminutive scale."

¹Fals Borda (1960:23) actually presented this observation two years earlier: "Thus peer influence and personal example are so definitive in Saucio that they shorten the imitation process by eliminating the application and trial periods that appear among farmers in more literate countries" (emphasis, mine).

There is also evidence from Guatemala that the model might be inappropriate. Sol Tax (1972:130) writes: "With respect to garden agriculture, at least, the Indians are always willing to try new plants, or different seeds, or new techniques. Among some of them experimenting is a constant procedure." Tax views the Indians as innovative and not at all resistant to change, at least in garden agriculture, which has become an important source of income in Panajachel, the locus of his study. However, for farmers who are constantly experimenting, adoption (i.e., the final stage in the adoption process) might be unknown. It seems quite possible that some farmers may always be evaluating, re-evaluating, disadopting and adopting again, always in a slightly different manner than before. This clearly does not suggest the continuous use implied by adoption.

Mason, in his 1962 doctoral dissertation, found that the stages of the model do not appear in the postulated sequence. Rather, his research suggests that evaluation occurs before the interest-information stage. Moreover, adoption is not the terminal stage; further information seeking occurs after adoption as the individual seeks support for the new practice he has adopted.

The five stage adoption process model purports to explain the decision making stages undergone by farmers considering agricultural innovations. Developed in the United

States, the model has been applied in several nations, including several in Latin America. However, critics suggest that human decision making is far more complex than what the model would indicate.

Communication Channels

This section contains a discussion of channels of communication. After some crucial definitions, I outline several advantages and disadvantages of mass media and interpersonal channels and introduce two ramifications of that discussion: cultural selectivity of perception, and rumor. Finally, I emphasize the communication potential of combining mass and interpersonal channels.

A channel is the communication medium used to transfer a message to the audience: e.g., personal conversations, meetings, telephone, radio, telegraph, newspapers, magazines, books. Many communication researchers refer to two channel categories: mass media and interpersonal channels. The mass media, of course, are the numerous print and electronic modes of communication. Word-of-mouth communication between family members and neighbors, acquaintances, and extension agents is regarded as interpersonal.

A source is the originator of the message which is conveyed by a channel. At TGVM a radio announcer is the source of a message. He not only articulates the message, but composes it as well; radio is the channel used to convey his

message. I find it convenient to refer to sources as either localite or cosmopolite. These radio announcers, composing their own messages for broadcast, are localite sources in Nahuala. Other announcers who were not from the same social system would be regarded as cosmopolite sources.

Schramm (1954:88-90) suggests that interpersonal and mass media channels perform different functions. This implies that each has intrinsic advantages and disadvantages with regard to the other in terms of optimum response to a message. (In pro-development messages optimum response usually means the adoption of some innovation or mode of behavior which the source favors.) Schramm indicates that channels have the following dimensions:

a. Space-time. Newspapers, still photographs, books, and health posters are space-organized. A radio broadcast is time-organized, while face-to-face communication, sound films, and television are both time-and-space organized.

The space-organized media appear to offer the audience more favorable conditions for absorption of difficult concepts, those found in a school math text, for example. This is because the eye can handle more information than the ear, and quite possibly groupings of words are less efficiently perceived by ear. This would seem especially true when the listener is not fluent in the spoken word; Quiche speakers in Nahuala can tune in any of the Spanish-speaking

commercial radio stations, but they report that they do not understand them very well. On the other hand, the time-organized media appear to offer certain advantages for memory learning of simple material, such as in advertising jingles; peasants might memorize information contained in chemical fertilizer advertisements, for example.

b. Participation. Interpersonal communication, with a higher degree of social participation and feedback, may tend to create a sense of involvement. High-participation media seem suited to the task of exchanging and sharpening opinion. Low-participation media seem useful for swift communication of information to large numbers of individuals.

c. Speed. Certain mass media pass information more swiftly than interpersonal communication. These mass media project a considerable sense of timeliness as well, an advantage for journalists and others having messages for prompt dissemination. Conversely, the slower media naturally lend themselves to study and reflective purposes.

d. Permanence. Books probably provide the greatest permanence; radio and television probably allow the least. Books and magazines, unlike the less permanent channels, are available for continuous reference.

In addition to these, Rogers (Solo and Rogers 1972:127) posits that mass media are important in conveying information, while interpersonal communication is more likely

to cause attitude change. Thus, if persuasion is the goal, he believes that interpersonal channels are more likely to bring it about.

Schramm (1954: 90) emphasizes that of much greater importance than such broad general laws are "the specific details of how a given channel is regarded and used in a given culture." This varies not only from country to country, but, in many cases, from region to region within a country as well.

Communications researchers know that messages are always perceived in a culturally selective manner. That is, one's perceptions are a function of what Schramm (1954:125) calls "the 'higher order' cognitive organizations--of belief, of social ideals, of morals, of cultural frames of reference." People tend to open themselves to messages which are in accord with their existing attitudes and interests. People favor their predispositions through selective exposure, selective perception, and selective retention (Klapper 1969:19-23) .

Interpersonal communication channels are useful in dealing with cultural predispositions because they facilitate immediate verbal and non-verbal feedback from the audience. Feedback provides clues which enable one to recognize and handle selective perception. Sensing that he is not reaching the audience, a source can try alternate communication

strategies. With mass media channels, however, audience feedback to the message source is delayed considerably.

Another phenomenon with cultural ramifications occurring in interpersonal communication channels is rumor, defined as an unverified and probably false report (Shibutani 1966:3). Rumors often accompany the introduction of innovations among peasants and probably occur because of inadequate exchanges of ideas between peasants and those introducing the innovation. This can lead to misperceptions and misconceptions of the change agent's motives and intent¹.

It is seen from the preceding discussion that interpersonal and mass media channels function in different ways, each channel having unique characteristics. Rogers (Solo and Rogers 1972:125) summarizes these communication characteristics associated with interpersonal and mass media channels:

¹Since at least the days of the Spanish conquest, strangers have been trying to change the attitudes and behavior of the Maya Indians, often with devastating consequences for these Indians (e.g., death, slavery, and loss of land). While most change agents are convinced of the "obvious" advantages to the Indians of modernization programs, one can understand the Indians' suspicion toward these strangers.

Communication Characteristic	interpersonal	mass media
Direction of message flow	two-way	one-way
Speed to a large audience	slow	fast
Ability to select receiver	high	low
Ability to overcome selectivity	high	low
Amount of feedback	high	low
Possible effect	attitude change	increase knowledge

It is clear from the chart that each channel appears to have shortcomings in comparison to the other. For example, interpersonal media permit two-way communication between source and audience, but these media cannot provide swift transmission of a message to, say, the whole of western highland Guatemala. Similarly, while radio can quickly deliver a message to any point in the republic, such a message, while it may increase audience awareness, may not result in attitude change.

Recognizing the presumed strengths and weaknesses of the interpersonal and mass media channels separately, it is common in diffusion projects to combine these channels in order to maximize the impact upon the audience (Solo and Rogers 1972; Schramm 1954; Spector et al. 1963). This is a principle operationalized by radio listening groups. A presumably relevant message is swiftly disseminated throughout a large area; interpersonal discussion after the broadcast is intended to increase the likelihood of attitudinal change, among other things. The reader may wish

to refer to the chart above in order to more clearly determine the possible advantages of combining the mass media and interpersonal channels. These thoughts will be illustrated when I discuss media forums and Latin American radiophonics schools following the next section.

Empirical Communication Channel Research in Latin America

In this section, I review the research pertaining to communication channels in Latin America and relate it to the adoption process. As suggested earlier, many authors believe that mass media and interpersonal channels function differently. For example, mass media channels permit widespread exposure to a message; interpersonal channels, which allow two-way interaction and feedback, facilitate attitudinal change among listeners. The reader may find it helpful to keep the attributes of mass and interpersonal channels in mind when contemplating this and the remaining sections of this chapter.

There are few Latin Americans who have not been exposed to the mass media¹. Radio, particularly since portable models became affordable with the introduction of the transistor, is

¹McNelly points out that the full range of mass media is available in the big cities. He also states that, "among professional, technical and well-to-do urban groups in Latin America, media use is roughly comparable to and in some cases higher than among similar groups in the United States" (McNelly 1966:350).

an almost ubiquitous medium. Since 1969, the total number of radio sets in Latin America has increased by 155 per cent (McAnany 1973:1). Deutschmann, working in a little-developed Colombian village, found that the mass media were not only filtering in but were having an apparent effect on some farming decisions. Among people with more mass media exposure opportunities, he found more knowledge of and favorable attitudes toward agricultural innovations (Deutschmann 1963:32).

Alan Holmberg, an anthropologist working some years ago among the Quechua in the Peruvian Andes, found that these peasants had had little contact with any media. Showing a public health film revealed that "the picture had failed to convey its intended message, for each scene was understood as a separate incident" (Adams et al. 1960:105). He concluded that, at least in the beginning, face-to-face communication and demonstration were necessary to effect particular changes when the people lacked a prior exposure to mass communications forms.

In an early experimental study of four Ecuadorian communities (one of the few experimental communication studies done in Latin America), Spector reported that radio programs were "especially suitable for inducing people to participate in free public health practices, such as immunization." He found that audio-visual media

(demonstrations, movies, slides) were more suitable when providing instructions about specific procedures. Spector concluded, however, that a combination of radio and the audio-visual modes was "moderately suitable to all types of practices" (Spector et al. 1963:98).

Deutschmann and the Colombian sociologist, Fals Borda, inquired as to how peasants in a Colombian village first became aware of six farm practices. They sought to determine the channels through which people first heard (awareness stage) about each of the six farm practices and concluded that most people had learned of the practices through interpersonal channels. Indeed, only five of the 71 farmers reported receiving first information from mass media. Only seven more mentioned the mass media as supplementary sources, after having been made aware first through interpersonal channels (Deutschmann and Fals Borda 1962a:19).

Of the farmers receiving their first information through interpersonal channels, other local farmers provided information to 43 per cent. Fifty-seven per cent of the respondents were made aware by people (mostly farmers and shop keepers) from other communities (Deutschmann and Fals Borda 1962a:20). The important point here is that the overwhelming majority of peasants interviewed became aware of farm practices from other people, not from the media.

Rogers examined the adoption of a weed spray among peasant farmers in three Colombian villages. He looked at channels not simply as mass media or interpersonal, but as localite or cosmopolite as well. Thus, channel has two dimensions: (1) interpersonal or mass media, and (2) localite or cosmopolite. A channel is localite if the message source is inside the social system of the receiver. A channel is cosmopolite if the message source is outside the receiver's social system (Rogers with Svenning 1969:127). For example, a government extension agent from Guatemala City explains the benefits of compost to a farmer from the mountains. On the one dimension, the channel is interpersonal. On the other dimension, the channel is cosmopolite if the agent (message source) is a Ladino and outside of the farmer's social system.

Rogers sought to determine the channel which the respondent regarded as most important for each of the adoption process stages. For example, to determine the most important channel in the awareness stage, he asked where or from whom the respondent first received information about a given spray (Rogers with Svenning 1969:128). A methodological weakness here is that Rogers determined this information on the basis of only one question for each adoption stage, a procedure which allows more measurement error than if the measure for each stage had been based on several interrelated

questions.

Rogers found that no respondent mentioned mass media channels as being important at any stage of the adoption process¹. He concluded that interpersonal channels are of prime importance at all stages². Because the use of mass media was so rarely reported by the peasant respondents, Rogers suggests that "perhaps the cosmopolite/localite channel classification has greater cross-cultural utility in explaining diffusion than does the interpersonal/mass media categorization" (Rogers with Svenning 1969:133).

Like Deutschmann and Fals Borda (1962a) and Rogers with Svenning (1969), Canizales concluded that interpersonal channels are of paramount importance in the agricultural communication process. Of his Mexican respondents, Canizales found that 58 per cent of the tenant farmers and 98 per cent of the landowners own radios. Significantly, however, less

¹Frey (1966:198) argues that mass channels may be more important than Rogers' research would seem to suggest. He posits that people are "probably biased toward the more proximate and specific stimuli and slight the temporally more remote or more general stimuli." The mass media would probably fall into the latter group.

²These results differ somewhat from those of Deutschmann and Fals Borda elsewhere in Colombia, who reported that seven per cent of their respondents received first information from mass media. One could build a strong case by arguing that the difference between the researchers' results is due to chance fluctuations in the data. The reader will have to determine this for himself.

than 10 per cent mentioned radio as a source of farm information, while 80 per cent of those questioned indicated relatives and neighbors as information sources. Venugopal reached similar conclusions in India (Prawl 1969:57).

From this discussion it is evident that mass channels of communication, particularly radio, are prevalent in many parts of Latin America. Indeed, in the early 1960's, some researchers (e.g., Paul Deutschmann in 1963) suggested that mass media messages were effecting change in peasant farming practices. Spector concluded, on the basis of his experimental findings, that the mass media were useful tools in development. Evidence from Deutschmann and Fals Borda (1962a), from Rogers with Svenning (1969), and from Prawl (1969), however, clearly suggests that mass channels alone have limits if one's goal is persuasion; the mass media by themselves do not appear to be significant factors at any stage of the adoption process. On the other hand, Rogers stresses the importance of interpersonal channels at all stages of the adoption process. Hence, this suggests the need for strategies designed to combine mass and interpersonal channels in order to maximize the communication potential.

Radio Listening Groups and Radio Forums

The listening groups and radio forums have been doing for years what communication scientists have only recently begun to recommend: combining interpersonal channels and the

mass media.

Radio listening groups came into being in Great Britain in 1928 and were originally formed to encourage citizen discussion of public affairs. Some 4,000 groups were organized during the twenty years until they went out of existence in 1948 (Cassirer 1959).

These RLG's, as they were called by some, were the forerunners of the much more widespread and widely recognized radio farm forums. The farm forums first appeared in Canada in 1939 (Nicol 1954). Such forums were composed of small groups of people meeting at least once a week; they listened to rural news, answers to listeners' questions and to the presentation of a discussion, dramatization, or lecture on a topic of interest to local groups. After the 15 to 30 minute presentation, the volunteer listening groups began a discussion among themselves. The forums sent written reports to the radio station, providing a feedback loop. As forums were begun in other nations, most adhered to this basic strategy which utilized both the radio and interpersonal channels.

Radio agricultural and educational forums soon appeared in many parts of the world, almost exclusively in developing countries: Japan (1952), Thailand (1954), India (1957), Pakistan and Mali (1961), Nigeria (1962), Ghana, Madagascar, and Jordan (1964). In addition, radio forums have been

established in Costa Rica, Brazil, Togo, Malawi, and Niger (Klonglan 1967; Schramm 1967; UNESCO 1967b).

Most radio forums throughout the world, initiated in part to enhance the diffusion and adoption of agricultural and health innovations, combined mass media and interpersonal channels. The radio channel greatly increases audience size while the interpersonal nature of the radio forums seems to increase the impact of innovation-oriented messages by reducing the likelihood of selective perception (Hiniker cited in Rogers et al. 1971:264).

Radio forums have been widely acclaimed as a boon to development. Indeed, Wilbur Schramm (1967:88-89), after an evaluation of programs in India, Niger, and Togo wrote:

...we need have few worries about telling a developing country that a radio broadcast fed into a supervised forum group, with adequate arrangements for feedback from the forum to the source of the programs, is an effective way to carry development information into a community and encourage innovation.

In spite of their considerable appeal to development workers, however, radio forums appear to share certain problems. For one thing, empirical evidence of the media forum effects is rare (Rogers et al. 1971:262), and much of the evidence recommending the forums is of a highly subjective nature. In past years, foreign communication "experts" often evaluated a nation's radio forum programs by

visiting the meeting places and conversing with monitors and students over a period of a few weeks. They then returned home and wrote long evaluations, which frequently called for more rigorous data collection--next time¹.

Three experiments with radio forums suggest that this is an effective communication mode (Spector et al. 1963; Rogers, Ascroft and Roling 1971; Roy, Waisanen, and Rogers 1968). In general these researchers attempted to measure increased knowledge through forum participation, changes in attitudes toward innovations, or actual adoption of new practices. It is, however, difficult to partial out changes which forums bring about from those caused by other phenomena at work within the target communities. Experimental control in these situations is all but impossible, and there is no way of gauging the effects of some of the following on the dependent variable (i.e., changes in knowledge or attitudes): other mass media, development agencies, schools, churches, trips, personal conversations.

In spite of their effectiveness, radio forums can be

¹"Gone should be the initial ten-day, ten-man expert team that flies in, around and out of a country to identify projects with a price tag of more than ten million dollars.... Gone should be the extremely long and detailed outside evaluation of the projects based upon the inputs used, construction completed and money spent. In their place should be a healthy appreciation for the perceptions, interests and risk considerations of small farmers themselves" (Morss 1976:11).

hampered by obstacles to successful operation. Radio forums often lack feedback between sender and receiver. This problem is especially acute when production efforts are centralized. However, in many countries, the central office (i.e., that responsible for programming/broadcasting) appoints liaison workers to facilitate communication between central office personnel and the radio forums (McAnany 1973:11).

Liaison problems in some countries take on another dimension due to lack of coordination at the ministerial level. McAnany (1972b) points out that radio can only reflect development plans elaborated by the various ministries, and, "if plans do not meet the real needs of the rural areas, radio cannot solve these needs independently." In order to have maximum impact, radio must be a part of an appropriate development scheme, well coordinated and with the needs of the target audience uppermost in the planners' minds.

That I have signalled a few of the obstacles which many radio forums must surmount should not detract from their tremendous potential in development. It appears that a great many of the problems encountered stem not from any inherent weakness in the radio forum but, rather, from problems of coordination, planning, and support. Governments could maximize the potential of radio forums by creating policies which favor rural development and by utilizing radio forums as one aspect of a well-conceived total development strategy.

The Radiophonics Schools of Latin America

The oldest radio schools in Latin America are those of Radio Sutatenza in Colombia, begun by a Catholic priest in 1947 to reduce illiteracy in the rural areas. Radio Sutatenza has grown rapidly, and by 1968 it had 22,000 centers with more than 167,000 students enrolled in the three levels of education. Sutatenza's budget for 1968 was US \$4.2 million.

Radio Sutatenza's efforts are devoted almost entirely to literacy, basic education for adults (reading, writing, arithmetic, agriculture, health), and religion. The instructional approach is multi-media, utilizing radio, printed books, and often filmstrips, charts, and newspapers as well. The radio schools, small listening/discussion groups, meet in homes, churches, or public buildings under the charge of a volunteer monitor. Feedback between the radio station and the radio schools in the field is maintained by supervisors who make periodic visits to each radio school.

Radio Sutatenza, through its international division, OSAL, has encouraged the founding of radio schools in other Latin American nations; there are 25 similar projects in Latin America having formal relations with OSAL. Generally these radio schools follow the educational approach outlined in the preceding paragraph (McAnany 1973:13).

Most Latin American radio schools are closely linked to Catholic institutions and usually depend upon financial

contributions from parishioners in the developed countries to meet their budgets. This close religious affiliation helps ensure that program content is free of partisan political influence--no small concern in many Latin American countries. A second advantage is that the Catholic church's extensive parish system provides an existing structure which greatly benefits the educational program. Many peasants, having had ties with the church throughout their lives, are acquainted with the Catholic church's traditional involvement in childhood education. While they might boycott radio school adult education by an unknown agency, peasants may regard the church's role in such a program as appropriate.

Besides the church's infrastructure, radio school education has a number of other strengths, and among them is an exclusive orientation toward the rural audience and its problems. This concern is reflected in the radio school curriculum which emphasizes health and agriculture. The identification with rural life is so strong, that Colombian peasants moving into urban areas seem to lose interest in Sutatenza's educational program (Primrose 1966).

Another strength of the radio school movement stems from its practice of group listening and its network of local monitors and supervisors. Primary group support is valuable in motivating students to persevere and in encouraging them that they can learn, even in a rural situation fraught with

obstacles to education. The monitor, a neighbor and often a fellow student, provides additional encouragement. The supervisor performs linkage and feedback functions between the programming/transmitting center and the radio schools in the field (McAnany 1973:17).

Finally, the radio school movement combines mass media and interpersonal channels to good advantage. Utilizing both interpersonal and radio channels, many radio schools also integrate printed matter and audio-visual aids including posters, charts, and filmstrips.

There are problems with the radio school strategy which many projects have yet to surmount¹. A disadvantage of church affiliation is that a few principals in the institution's hierarchy may insist on making the top policy decisions. Early (1973:226) cites a case in Guatemala where the radio school personnel formed a corporation in accordance with Guatemalan law; the American diocese then turned over all broadcasting equipment to the corporation. However, the Bishop of Guatemala refused a request to relinquish the station's radio license, because he believed that "the station and organization should be controlled by a priest who

¹The reader may wish to refer to problems of the radio forums mentioned in the preceding section. These same problems are found in many radio school operations, and the discussion will not be repeated at this time.

would appoint a board of directors."

The Documentation Center for Educational Communication (CENDOC), points out that some radio schools collaborate with the nation's ministry of education regarding the basic education curriculum. Through such collaboration, students can receive an education which the ministry regards as equivalent to that offered in public schools, and students completing the two or three levels of the school curriculum receive bona fide diplomas. However, as CENDOC (1976) sees it, those radio schools pay dearly for the privilege of awarding official diplomas:

...until what point is it convenient to continue financing alphabetization projects and primary education in order to receive official recognition and have to communicate content scarcely significant to the rural farmers?¹ (my translation and emphasis)

CENDOC's point is that schools collaborating with education ministries face governmental demands which can only lead to less relevant radio school education in the rural sector.

CENDOC suggests an alternative:

In our opinion, educational radio which is

¹...surge...la interrogante de hasta que punto es conveniente seguir financiando proyectos de Alfabetización y Educación Primaria...por /sic/ lograr el reconocimiento oficial debe entrar a comunicar contenidos escasamente significativos para el campesino.

oriented to the rural world, ought to give priority to a perspective much more concerned with social change than mere schooling. These institutions ought to emphasize content which is really significant for the audience, a kind which assists in their reflection about reality...and helps them to face immediately their basic problems of work, health, etc.¹ (CENDOC 1976, translation, mine).

The influence of Paulo Freire, the Brazilian adult educator, is evident in the CENDOC point of view.

Another problem faced by radio schools is that planning and organization are often poor. There is a need to reflect upon objectives, programs, and methodologies. As a Mexican investigator of radio schools for the Tarahumara Indians noted,

There wasn't even sufficient information to know what the radio schools had accomplished to date. They had functioned on the basis of trial and error; and their conditions of opening, location, and closing remained subject to the greater or lesser pressures of the local people and the

¹En nuestra opinion, la Educacion Radiofonica orientada al mundo rural, debe dar prioridad a una perspectiva mas orientada al Cambio Social que a la mera escolarizacion. Estas instituciones debieran hacer hincapie en la transmision de contenidos realmente significativos para la audiencia, de modo que, posibiliten su reflexion sobre la realidad...y faciliten encarar de manera inmediata sus problemas basicos de trabajo, salud, etc.

preferences of the directors¹ (Schmelkes de Sotelo 1971:127, translation, mine).

Yet another problem relates to radio schools' rejection of politics and political action as a method of achieving rural social change. On the one hand, remaining apolitical ensures their survival as autonomous organizations relatively free of overt government interference. However, there is a trade-off, as McAnany (1973:16) points out:

The disavowal of many radio schools to engage in mobilization of rural people toward community action because it is political means that radio school students must seek to work for change outside the radio school structure.

In spite of their problems, the radio schools are impressive--by the sheer size of their audience alone, to mention but one standard. Colombia's Radio Sutatenza serves 50,000 rural peasants in radio schools. International agencies like USAID, believing in the potential of radio school education, are now establishing programs and building transmitters. The basic strategy of radio school education appears to be sound. However, its efficiency could be

¹...ni siquiera se cuenta con una información suficiente sobre lo que han logrado hasta la fecha las ER. Estas han funcionado a base de prueba y error, y sus condiciones de apertura, localización y clausura quedaban sujetas a las presiones mayores o menores de los habitantes de la localidad en cuestión y a las preferencias de los directores.

enhanced by an introspective review of objectives and direction, striving always to increase radio school education's relevancy to the peasant audience which it serves.

METHOD OF PROCEDURE

Topic Selection

I first visited Nahuala, Guatemala, and radio La Voz de Nahuala (TGVN) in 1972. During this short visit, the station director, Sister Janet Druffel, and I spoke about collaborating on a research project in two years' time, when I would have completed coursework for the Ph.D.

I spent a month in Nahuala in July of 1974, during which time the radio station staff and I selected a general research topic: an examination of the adoption and diffusion of several agricultural innovations emphasized by TGVN. After my return to the United States, we continued refining the topic, attempting to improve it in ways which might provide maximum benefit to the radio station.

The scarcity of diffusion research in Guatemala presented an immediate problem for this study, and it was necessary to remain adaptable regarding the research focus. Having no indication of what might be expected in the field, I chose to gather information on two related topics. Given the scarcity of previous research relating to my topic, of particular interest was the unanswered question of whether the Adoption Process Model (see focus 1, below) would transfer from the midwestern United States to highland Guatemala.

Thus, in collaboration with the radio staff, I selected two alternate foci:

1. an adoption process study of three agricultural innovations emphasized by TGVN: insecticide, chemical fertilizer, and compost heaps. That is, I desired to evaluate the extent to which the Xepatuj farmers have accepted these innovations. This would involve a determination of the number of farmers who were at each stage of the so-called adoption process: awareness, information, evaluation, trial, and adoption. A respondent's adoption stage would be determined for each separate innovation and utilized in the analysis as a dependent variable.

2. a factor analytic exploratory approach where I would collect data on a large number of variables pertaining to the communication of information about insecticide, chemical fertilizer, and compost heaps. After reducing the number of variables on the basis of correlation analysis, I would subject the remaining variables to a factor analysis in order to reduce the matrix to its basic dimensions.

I ultimately elected to proceed with the second option above, the factor analytic, exploratory approach. I deleted the adoption process focus entirely, because, in my judgment, the model was inapplicable in this community. (Please refer to the Review of the Literature and Discussion sections for further comments.)

Development of the Questionnaire

The items come primarily from three sources:

1. from the author,
2. from factor analytic studies done on adoption and diffusion of farm practices in various parts of the world,
3. and from a USAID study undertaken in eastern lowland Guatemala.

I attempted to collect items which I believed to be associated with the innovations under investigation. My intention was to arrive in the field with surplus items, expecting that the radio staff would delete ambiguous or otherwise inappropriate questions.

I had intended that the instrument be translated from Spanish to Quiche, so that the interviewers could simply read each question to a respondent without having to translate instantaneously from Spanish. This would also have ensured that all interviewers consistently asked the same questions. However, the task of translation proved to be enormous.

One of the radio station employees took two full days to translate the questionnaire from Spanish into Quiche. Working independently, another radio station employee re-translated the same items from Quiche back into Spanish. I had not expected to find so many discrepancies between the original Spanish version and the copy which resulted after the re-translation from Quiche. It was therefore decided to provide the interviewers with intensive training on interview technique and on the precise meaning of each item but to leave the questionnaire in Spanish. Each interviewer would read the items in Spanish and ask the questions in Quiche

during the interview. As will be seen, even this procedure was modified.

The Interviewers

The five interviewers were permanent TGVN employees whom the station director assigned to the research project. Their native language is Quiche; each man had learned Spanish as a second language. Most had had three years of formal education.

The interviewers underwent a five-day training period, approximately 35 hours. Since most were unacquainted with at least a few Spanish terms on the questionnaire, considerable drill was required at the beginning. Once the items were understood, the men developed an interviewing style through role-playing the interview situation. On the fifth and final day of training, the interviewers went into the field for practice in a locale some distance removed from the research target area.

Target Area for Research and Sample Selection Technique

The research was conducted in Xepatuj, a canton of Nahuala. Originally respondents were to be selected randomly on the basis of a multi-stage sample. Toward the accomplishment of that sample my wife mapped the entire research area, a process facilitated by the topography. Standing at various points along a ridge, she simply mapped

the houses of Xepatu, which is situated in a hollow. A former Auxiliar del Canton Xepatu was on hand to provide the names of home owners¹.

However, an area sample proved infeasible because of the difficulty of dividing the area into segments. Mapping house locations and identifying data (e.g., roof type, wall color, direction which the house faces) was relatively easy; it was more difficult to indicate the most logical boundaries of the segments, the network of footpaths.

Although the maps were not utilized for the original purpose of making an area survey, they were very useful nonetheless. Simply drawing these maps was instructive, because this procedure brought us into intimate contact with the layout of the research area. Furthermore, from the maps, we were able to estimate the population size of the community. Finally, when the research teams were in the hollow amid the ubiquitous tall corn (about seven feet high), the maps pinpointed the location of the nearest residence which had not yet been surveyed.

Because of the difficulties of random sampling, the author chose to survey the entire population of farmers, approximately 160. This, too, proved unmanageable, and the

¹The Auxiliar del Canton must know the names of all canton residents in order to carry out his civic duties, which include periodic visits to every house in the canton.

present research is based on 146 respondents. We were unable to interview the entire population primarily because of the interviewers' commitments to their own families and to the radio station. Each had to take his vacation before the start of the new school year in January. For the station staff, vacations provide the year's best opportunity to do necessary chores in their homes and fields. Also, none of the interviewers had posted the grades from the preceding year; the accomplishment of this task became more urgent as the new school year approached.

The Respondents

The elements of interest in this study are heads of household, who are also the most influential family members in making farming decisions. All live in Xepatuj. Most of these subsistence farmers own small parcels of land on which they plant mainly corn, with some wheat and potatoes. Virtually all are Indian, descendents of the ancient Mayan civilization, and most speak only Quiche. In terms of heritage, occupation, and economic difficulties, highland Guatemalan Indians are a fairly homogeneous group. They live in a nation dominated by the Spanish-speaking Ladinos (mestizos or people of mixed blood). Jones' remarks, written in 1940, are still appropriate today, as he describes the indigenous people as a

nation within a nation.... Their culture has

continued since the time of the conquest, now more than four hundred years ago, highly resistant to modification by outside influences.... The Indian social organization is to a surprising degree still what it appears to have been when the Spaniards entered the country (Jones 1940).

Data Collection

All data collection was done on a team basis. The basic team consisted of one of the researchers (my wife or myself) and at least one interviewer. It was highly desirable to have two interviewers per team, in order that one might complement the other in the data-gathering process, and especially in translation. This could not always be arranged, however.

In the very early stages of data collection, the interviewers functioned without the active participation of the researchers, who were largely on-lookers. Thus, the interviewer read each question to himself and translated it into Quiche; he then translated the respondent's answer into Spanish and made the appropriate notations on the instrument. Such an operation was extremely time consuming because certain interviewers could neither read nor write with moderate speed. Therefore the procedure was modified so that the researcher read the questions to the interviewer in Spanish and noted the respondent's translated responses on the answer sheet. This modification was satisfactory to all concerned and shortened the average interview time to about an hour.

Each team worked an eight-hour day, usually beginning at 8 A.M. Interviews were conducted in the respondents' homes. With perhaps four or five exceptions, members of this community agreed to the interviews. Each team strove for six interviews daily but very frequently completed fewer. Walks between dwellings were time consuming, particularly toward the end of the study when we had to travel greater distances. Also, the inevitable second and third visits in order to find certain farmers at home affected the number of interviews completed during any day.

Data Treatment

Each evening the researchers reviewed the interview instruments which had been completed during the day. We scanned for missing data and scrutinized the instruments for evidence of inadequate translation or misunderstanding. This was done by ensuring that responses were consistent with the questions asked. Examining the data at day's end was done in order to minimize errors of translation and codification.

On the first day of the survey it became apparent that the multiple choice-type responses provided with each item were insufficient to record the diversity of the respondents' replies. These varied responses were duly noted in the margin, but the unexpected number of marginal notations necessitated a re-coding of the questionnaire items in order to account for all possible replies to the items.

The researchers then assigned additional codes, so that many items were coded between two and five different ways. This was done in order to make the most sense possible out of the data. Those items, each coded in several different ways, are known as part-whole responses. With the addition of the part-whole items, the 101-question instrument comprised 160 variables. The coding completed, the researchers transcribed the information onto paper for keypunching.

After obtaining the usual frequency information on each item, a grand correlation matrix was produced. That is, the 160 variables were intercorrelated. Pearson Product Moment correlations, as calculated by the SPSS computer program, were utilized.

Through a laborious search of the correlation output, the number of variables was reduced to 57. Variables were retained which appeared to correlate highly ($> .5$ or $.6$) with at least three other variables. Those with low intercorrelations were excluded from further analysis. Part-whole variables were selected on the basis of high intercorrelations with variables belonging to the same part-whole cluster and with the other variables on the grand correlation matrix.

These 57 variables were subjected to a factor analysis, utilizing the SPSS computer program's principal factoring with iteration method. (The SPSS program replaces the main

diagonal elements of the correlation matrix with communality estimates.) A varimax orthogonal rotation was used (Rummel 1970:391).

RESULTS

The purpose of this chapter is to present the thirteen factors which emerged from the factor analysis. Following each table, I present a brief description of the factor and indicate its significant dimensions.

No attempt was made to determine statistical significance of the loadings for two reasons. There is no commonly accepted procedure for determining level of significance. Moreover, the descriptive, exploratory nature of this study precluded the deletion of lower-loading variables from the tables. Consequently, each reader is invited to determine meaningful levels of significance for his own purposes.

Each of the following tables is composed of three columns. The questionnaire item numbers correspond to those in the actual survey instrument which was used in the field. (The Spanish language instrument is reproduced in Appendix A). The items column contains a short English paraphrase of each question. The loadings column specifies loadings obtained by a factor analysis of the data.

Table 1. Factor loadings for items associated with factor 1.

questionnaire item numbers	items	loadings
26	Apply insecticide to corn, wheat, or potatoes?	.90
24	Apply insecticide to wheat this year?	.90
13	Receive insecticide information more than once?	.89
15	How defines "insecticide?"	.88
22	Where receive important insecticide information?	.87
12	Where receive first insecticide information?	.86
19	Ever thought about using insecticides?	.85
25	Apply insecticide to potato this year?	.84
18	Where could get more insecticide information?	.83
14	Where received more information about insecticides?	.81
11	When first heard about insecticides?	.74
17	How many insecticides can list?	.72
56	Advantages of making compost heap?	.45
98	Speak Spanish?	.38
53	Ingredients of a compost heap?	.35
83	Obtain good agricultural advice from radio?	.32
59	Plan to make compost heap next year?	.32
55	Thought about making compost heap?	.32
65a	Spoke to visiting agricultural technician?	.31
89	Which kinds radio programs preferred?	.31
51	Received compost heap information more than once?	.31
64	Who advised farming changes?	.31
90	How many radio stations can list?	.29
84	Good agricultural advice from printed matter?	.29
58	When made compost heaps?	.28
88	Hours per day listens to radio?	.26
97	How many in house can read?	.26
37	How many fertilizer formulas can list?	.25
35	Where received more fertilizer information?	.25
87	Good agricultural advice from agronomists?	.24
34	Received fertilizer information more than once?	.22
82	Good agricultural advice from relatives?	.20

Factor 1 is an insecticide factor because the higher loading factors quite clearly pertain to these chemicals. It must be mentioned at the outset, however, that because almost 70 respondents were unaware of insecticide, this factor shows clear evidence of correlated errors. That is, because almost half of the respondents received the same code¹ on all of the insecticide questions (the first 12 items of Table 1) this factor was predestined to emerge. These 12 items represent an aware/unaware of insecticides dimension.

The rest of the table items (beginning with 56) are free of correlated error and will be utilized in the next chapter to explain the aware/unaware dimension. One notices in these latter table items both channel dimensions (mass and interpersonal) as well as source dimensions (cosmopolite and localite).

¹Each of the unaware respondents received the same code. Please refer to the questionnaire in the Appendix.

Table 2. Factor loadings for items associated with factor 2.

questionnaire item numbers	items	loadings
43	When apply fertilizer to corn?	.69
44	When apply fertilizer to wheat?	.65
38	Ever thought about using fertilizer?	.63
46	Plan apply fertilizer to corn next year?	.55
63	Changed farming techniques recently?	.55
34	Received fertilizer information more than once?	.45
37	How many fertilizer formulas can list?	.40
47	Plan apply fertilizer to wheat next year?	.40
98	Speak Spanish?	.35
97	How many in house can read?	.34
90	How many radio stations can list?	.30
35	Where received more fertilizer information?	.27
41	Amount fertilizer applied to wheat?	.26

Factor 2 is a corn-wheat fertilizer factor. For the most part, four types of variables are reflected in this configuration: 1) those variables loading highest belong to an application dimension having a temporal perspective (items 43, 44, 41, and 63), 2) a knowledge or information component (items 34, 37, 90, 35), 3) an evaluation dimension (38, 47, 46) and 4) an education dimension (98, 97).

There is little difficulty with correlated error in this factor, because virtually all respondents were aware of chemical fertilizer. Therefore, interpretation of dimensions within the factors is much less ambiguous. One can, for example, examine items 43 and 44 as an apply/not apply

dimension rather than as an aware/unaware dimension, which would have been necessary in the event of a large number of unaware responses.

Table 3. Factor loadings for items associated with factor 3.

questionnaire item numbers	items	loadings
67	Amount of owned land?	.92
68	Amount of land in corn?	.78
69	Amount of land in wheat?	.74
100	Number persons living in home?	.44
70	Number farm animals?	.41
95	Age?	.27
37	How many fertilizer formulas can list?	.26
41	Amount fertilizer applied to wheat last year?	.25

Factor 3 is a total farmland factor. This interpretation is made in light of the three highest loadings, which pertain either to land owned or to land devoted to one of the region's important crops. The factor also contains a significant descriptive component with variables 100, 70, and 95. Knowledge and application dimensions of fertilizer (items 37 and 41) are also present in the data.

This factor was predestined to emerge due to the positive intercorrelations between items 67, 68, and 69. That is, if a Xepatuj farmer owns land, he will undoubtedly plant corn and will quite possibly plant wheat.

Table 4. Factor loadings for items associated with factor 4.

questionnaire item numbers	items	loadings
55	Thought about making compost heap?	.79
59	Plan to make compost heap next year?	.79
52	Where received more compost heap information?	.76
51	Received compost heap information more than once?	.76
58	When made compost heaps?	.65
56	Advantages of making compost heap?	.64
53	Ingredients of a compost heap?	.52

Factor 4 is a compost heap factor and was predestined because 22 respondents were unaware of compost heaps. Thus, since 22 individuals received the same code on each item in this factor, these seven highly intercorrelated items were certain to emerge as one factor.

The items represent an aware/unaware of compost heaps dimension. Because no other variables emerged in the factor to help explain this single dimension, little interpretation is possible.

Table 5. Factor loadings for items associated with factor 5.

questionnaire item numbers	items	loadings
48	Plan to fertilize potatoes next year?	.84
42	Amount fertilizer applied to potatoes last year?	.83
45	When apply fertilizer to potatoes?	.76
25	Apply insecticide to potato this year?	.33
79	How many near-by villages visited?	.29

This appears on first glance to be a chemical fertilizer-to-potatoes factor. However, because a large number of respondents did not plant potatoes, the factor is essentially a planted/not planted potatoes factor.

Table 6. Factor loadings for items associated with factor 6.

questionnaire item numbers	items	loadings
82	Good agricultural advice from relatives?	.79
85	Good agricultural advice from friends?	.63
84	Good agricultural advice from printed matter?	.55
87	Good agricultural advice from agronomists?	.47
83	Good agricultural advice from radio?	.23

Factor 6 may be interpreted in at least two ways. This may be an agricultural-advice-from-localite-sources factor reflecting sources from whom local farmers actually get

agricultural advice. Some might argue that printed matter is transmitted through localite sources (e.g., local schools or TGVN). Similarly, it is quite possible that many of the respondents mistakenly regard the TGVN employees as agronomists. This would explain why "printed matter" and "agronomists", both usually cosmopolite in nature, could be regarded as localite in origin.

On the other hand, this may be thought of as an evaluation-of-agricultural-advice factor. While each question requires respondents to evaluate the sources, the problem is that a respondent may evaluate a source as good, even though he, himself, does not receive information from that source. We need not, however, subscribe only to one interpretation or the other; factor 6 may be both an agricultural-advice-from-localite-sources factor AND an evaluation-of-agricultural-advice factor.

Table 7. Factor loadings for items associated with factor 7.

questionnaire item numbers	items	loadings
88	Hours per day listens to radio?	.71
83	Good agricultural advice from radio?	.65
90	How many radio stations can list?	.63
89	Which kinds radio programs preferred?	.58
35	Where received more fertilizer information?	.44
53	Ingredients of a compost heap?	.24
66	With whom discuss agricultural problems?	.23
14	Where received more information about insecticides?	.22
46	Plan to fertilize corn next year?	.22
51	Received compost heap information more than once?	.22
52	Where received more compost heap information?	.22

This is an agricultural-advice-from-radio factor. It has three dimensions which are associated with radio: 1) a channels and sources dimension (items 35, 66, 14, 51, 52); 2) a knowledge dimension (53); and 3) an evaluation dimension (46).

Table 8. Factor loadings for items associated with factor 8.

questionnaire item numbers	items	loadings
91	How long attended radio school?	.86
92	Books used in radio school?	.85
97	How many in house can read?	.23

This is a radio school factor. The factor is comprised of only two items which relate directly to radio schools and provides only one variable which illuminates the radio school dimension.

Table 9. Factor loadings for items associated with factor 9.

questionnaire item numbers	items	loadings
65a	Spoke to visiting agricultural technician?	.67
64	Who advised farming changes?	.58
87	Good agricultural advice from agronomists?	.54
37	How many fertilizer formulas can list?	.36
84	Good agricultural advice from printed matter?	.36
97	How many in house can read?	.30
43	When apply fertilizer to corn?	.28
52	Where received more compost heap information?	.21

This can be described as a factor involving agricultural advice from interpersonal cosmopolite sources. Agricultural technicians, agronomists, and print media are often regarded as cosmopolite in nature. Items 64 and 52 can be regarded as cosmopolite because of the manner of their coding. (Please refer to questionnaire in Appendix A.)

Table 10. Factor loadings for items associated with factor 10.

questionnaire item numbers	items	loadings
95	Age?	.85
7	Years as principal farm decision maker?	.76
96	Number of children?	.25
37	How many fertilizer formulas can list?	-.26
98	Speak Spanish?	-.21

Respondent's age as it relates to farming is the theme of the variables comprising factor 10. Each of the five variables clearly pertains to "age". (Note that items 37 and 98 have negative loadings.)

Table 11. Factor loadings for items associated with factor 11.

questionnaire item numbers	items	loadings
96	Number of children?	.84
100	Number persons living in home?	.62
95	Age?	.21

The theme of these variables is respondent's age as it relates to the home. This factor provides little information, suggesting only the obvious: older respondents tend to have more children and tend to have children living in the home.

Table 12. Factor loadings for items associated with factor 12.

questionnaire item numbers	items	loadings
41	Amount fertilizer applied to wheat this year?	.74
47	Plan to fertilize wheat next year?	.60
41	Amount fertilizer applied to wheat last year?	.56
44	When apply fertilizer to wheat?	.42
52	Where received more compost heap information?	.26
67	Amount of land in wheat?	.21
38	Ever thought about using fertilizer?	.21

The higher loading variables pertain to a planted/not planted wheat factor. This factor emerged because of the significant number of respondents who did not plant wheat.

Table 13. Factor loadings for items associated with factor 13.

questionnaire item numbers	items	loadings
46	Plan apply fertilizer to corn next year?	.57
35	Where received more fertilizer information?	-.38
66	With whom discuss agricultural problems?	.38
47	Plan to fertilize wheat next year?	.33
79	How many near-by villages visited?	.26
89	Which kinds radio programs preferred?	.25

This is a fertilizer and information factor. Due to the relatively low loadings and conflicting data (items 35 and

66), this factor probably contains several spurious correlations. Items 35 and 66 should be in basic agreement; however, one has a negative sign, indicating a negative correlation when we would expect to find a fairly strong positive association.

DISCUSSION AND FURTHER RESULTS

In the first section of this chapter I describe the channels and sources of agricultural information to which Xepatuj farmers have recourse. I also present evidence regarding respondents' evaluation of agricultural advice as received from various sources. In the second section, the discussion becomes more specific as I relate channels and sources to the three agricultural innovations under study. I also relate the present research to the Adoption Process Model. The third section is an evaluation of the factor analysis results pertaining to communication of agricultural information. In this section I present a modified adoption model.

Exposure and Evaluation

Exposure to communication channels

My purpose in this first section is to discuss two topics related to the communication of agricultural information. I begin by examining respondents' exposure to some mass (viz. print and radio) and interpersonal communication channels (viz. agricultural technicians) as well as their exposure to a combination of these channels (viz. radio station TGVN and TGVN-sponsored radio schools). The second topic in this section pertains to respondents' evaluations of several farm advice channels and sources (items 82-87).

Few Xepatuj farmers have been exposed to print media, in part because of widespread illiteracy. Sixty-seven per cent of the respondents had never attended a public school, and of those attending, only 11% remained beyond grade three. Eighty per cent of the respondents had never attended a radio school, and of those who did go, fewer than 10% stayed beyond grade one (see Tables 14 and 15).

However, while few respondents are literate, over half of them reside with at least one literate family member (see Table 16). If more reading matter were available, some respondents might have access to the printed page through their relatives. It must be recognized, however, that printed matter--including agricultural information--is extremely scarce in Xepatuj. Newspapers being locally unavailable, anyone seeking printed matter would be limited to public and radio school readers.

Many more Xepatuj respondents have access to radio. The "transistor revolution" is much in evidence and one sees the ubiquitous battery-powered radio in homes, fields, and along the trails. Nevertheless, there exists a significant body of non-listeners (see Table 17), some of them simply lacking access to this mass medium. In addition, Table 17 indicates that 26% listen only to music. It follows that the number of listeners to TGVN's twice-daily agricultural broadcasts could

not be much over 50%¹, at best.

Except for TGVN, which transmits in Quiche and Cakchiquel on alternate days, no other receivable radio station broadcasts exclusively in an indigenous language. The other stations broadcast in Spanish, a language which 90% of our respondents do not speak. Therefore, except for information conveyed in a few easily understood commercial messages, most Xepatuj radio listeners lack access to agricultural information conveyed by these non-local radio stations.

The evening TGVN agricultural broadcasts are heard in the radio schools. As Table 15 indicates, 20% of the respondents have participated, although some for only a short period of time. However, Table 18 shows that of these participants, only five have attended a radio school in the past several years. (Such an inference may be drawn from the table because Amanecer replaced the Laubach reader and the Juan series only recently.) Thus, Tables 17 and 18 suggest that the canton Xepatuj radio schools have reached directly

¹I have no data regarding the number of individuals who listen to the TGVN agricultural broadcasts in their homes (versus listening in the radio schools).

only a few Xepatuj farmers per year¹.

In the interpersonal domain, the agricultural technicians are the most highly trained crop specialists who visit Nahuala. Table 19 indicates that only 10% of the respondents have spoken with one of these visiting technicians. This is not surprising because these professionals rarely meet with local farmers. For the past few years, government agronomists from INTECAP have held short courses for farmers--but only once a year. Nevertheless, crop specialists have given a tremendous stimulus to the TGVN staff and to a select few local farmers.

Evaluation of agricultural information

Tables 20-25 indicate how the respondents evaluate agricultural advice transferred through several mass and interpersonal channels. These tables are associated with items 82 - 87: Do you obtain good farm advice from _____? This question was asked with regard to relatives, radio, printed matter, friends, salesmen², and

¹This type of situation was found to exist in Turkey. "In the neighborhood of one third to one half of the peasants are not directly reached by radio.... The mass media would seem to be generally capable of reaching an impressive sector of the peasantry, though one can also be sure that another and perhaps somewhat larger sector will not be directly reached at all" (Prey 1966:50).

²These would be primarily sellers of seeds, agricultural chemicals, and implements.

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agronomists.

Of the mass and interpersonal media (cf. Tables 20-25), more people believe that good agricultural advice can be obtained from radio than from any of the other selectors. Because so few speak Spanish, the broadcast language of all receivable stations except TGVN, most respondents were undoubtedly referring to the local radio station.

Many farmers also claim to obtain good agricultural advice from relatives and friends (cf. Tables 20 and 23, respectively). Nevertheless, upon further examination of the table, one notices that a large number do not receive good farm advice from these particular interpersonal sources.

Clearly then, TGVN is seen as a better source of good farm information than farmers' own friends and relatives. The current literature suggests that subsistence level farmers tend to hold interpersonal, localite sources in higher esteem than mass media (Rogers with Svenning 1969). Do the present researcher's results tend to refute the findings of previous authors? Not really.

One reason is that most Xepatuj farmers know personally each of the TGVN announcers and staff. These radio employees not only enjoy a good deal of prestige in the community but several of them are regarded as outstanding farmers, as well. It is a rare situation in Latin America where most of the peasant farmers know personally the announcers and staff of a

radio station.

It is important to recognize that TGVN is a localite source. This is one of those unique cases in which a mass medium is a localite--rather than a cosmopolite--source. It is almost certain that the fact of interpersonal communication between the radio staff and the Xepatuj interviewees is reflected in the responses of the latter regarding agricultural advice from radio. In short, the mass channel has become a personal medium in Xepatuj.

TGVN's communication strategy utilizes both mass and interpersonal channels and localite sources. The interpersonal channels are both informal and formal. They are informal when the announcers and staff converse with local farmers in the markets, on the trails, and sometimes in one another's homes. The interpersonal channel is also formal, as when a staff member gives a lecture or demonstration. Hence, in the classificatory scheme employed in this research, TGVN is regarded as utilizing both mass and interpersonal channels with localite sources.

The evidence suggests that agronomists, salesmen, and printed matter rarely provide good agricultural advice. The responses to item 65a (Table 19) indicate that only ten per cent of Xepatuj farmers have ever spoken with an agronomist. Most farmers have never had the opportunity to meet with one, because these specialists rarely visit the community.

Similarly, a majority of farmers have little regard for the agricultural advice of either salesmen or that found in printed matter, perhaps because they have had little or no exposure to either.

Summary

In this section I discussed two topics pertaining to the communication of agricultural information. The first topic entailed an examination of communication channel exposure. It was shown that few farmers obtain such information from the printed page, primarily for two reasons: widespread illiteracy and lack of access to printed material. While there is a sizeable group of respondents who either do not listen to radio or who listen only to music, TGVN does present regularly scheduled Quiche-language farm programs. Because the other receivable stations broadcast in Spanish, Xepatuj farmers are often unable to obtain farm information from these foreign language transmissions. Evidence suggests that radio schools in Xepatuj are able to reach only a few of the community's farmers per year. It was also reported that trained agricultural technicians rarely meet with local farmers.

The second topic pertained to respondents' evaluations of agricultural information from relatives, radio, printed matter, friends, salesmen, and agronomists. Many farmers feel that TGVN is a better source of agricultural information than

their friends and relatives. Rather than indicating greater farmer reliance upon radio, however, these results reflect the TGVN communication strategy which combines mass and interpersonal channels with localite sources. Xepatuj farmers know the radio staff personally and respect a number of them as outstanding farmers. Thus, the mass channel has become a personal medium in Xepatuj. Finally, few farmers have high regard for agricultural advice from agronomists, salesmen, or from printed matter. It is precisely with these that the farmers have had the least experience.

Communication of Information Regarding

Three Agricultural Innovations

This section deals with the communication of information regarding three agricultural innovations: insecticides, chemical fertilizers, and compost heaps. In the case of insecticides, I will emphasize the role of various channels and sources¹ in communicating both First and Later Information. First Information refers to the first time that the respondent heard anything at all about insecticides. Later Information refers to subsequent information. In the insecticide sub-section, I will also examine channels and sources which farmers indicate they would use if they were

¹Channels or media are means of conveying messages from a source to a receiver. A source is the originator of a message.

seeking further (item 18) as well as important (item 22) insecticide information. My discussion of chemical fertilizer and compost heap information focuses on channels and sources which peasants utilized after initially learning about these innovations. That is, my emphasis will be on Later Information.

The terms First and Later Information can be related to the Adoption Process Model, discussed in the Review of the Literature. What I have called First Information is analogous to the Awareness Stage. Later Information, as I have conceptualized and operationalized it, does not correspond to any particular stage in the Adoption Model, because of my belief that knowledge is gained in all stages. Moreover, the present research does not emphasize adoption--rather, my focus is on channels and sources used to transmit agricultural information. Therefore, my interest is in Later Information per se without regard to further adoption stages.

It is my contention throughout this section that First and Later Information are not wholly dependent upon channels and sources. Indeed, I shall describe some characteristics of each innovation which bear directly on respondents' awareness. It will be argued that in some cases farmers tend to "tune out" change agent messages--regardless of the channel or the source.

These innovations were selected for investigation primarily because the TGVN staff had promoted each of them in broadcast programs as well as in community discussions and demonstrations. The radio's work--utilizing both mass and interpersonal channels with localite sources--increased the probability that a substantial number of peasants was aware of the three innovations, a necessary pre-condition for the study of channels and sources. However, as will be demonstrated below, peasants were exposed to other information sources besides TGVN.

Insecticides

Of 146 respondents, only 84 (58%) had heard about insecticides. (Please refer to Table 26.) That is, slightly over half of the respondents were acquainted with--not necessarily knowledgeable about--these insect poisons. (The purpose of item 10 in the questionnaire was simply to determine whether the respondent had at least a low-level awareness of insecticides.) Many were unaware of the word insecticida, the Spanish term (Quiche has no equivalent); in these cases, the interviewers persisted with questions such as the following:

1. Have you ever seen or heard about a substance used to kill bugs in corn, wheat, or potatoes?

2. Have you ever seen or heard about Aldrin¹?
DDT? Diterex?

3. Have you been to the Coast? Did you ever notice men with tanks strapped to their backs or low-flying airplanes spraying something on the crops?

If the respondent was really unaware of insecticides, we passed over the remaining items in the section and resumed the interview with the next innovation, chemical fertilizers. Otherwise, we continued with item 11.

Item 11: a temporal perspective Item 11 asks this question: When was the first time that you heard something about insecticides? Of the respondents who were asked the question, Table 27 indicates that First Information came only recently for many². In fact, 73% of them became aware after 1970. One of several causes of insecticide awareness was TGVN's insecticide campaign. In 1970 TGVN employees applied insecticide to about 200 farmers' fields free of charge. Farmers seemed enthusiastic. However, in the second year of

¹The few subsistence farmers who use insecticide on corn generally apply Aldrin. This chemical is no longer used in the United States since the Environmental Protection Agency restricted its sale and use and halted its manufacture in October 1974.

²None of the 62 respondents who were unaware of insecticide's existence were asked this question or any of the others pertaining to these poisons.

the campaign, TGVN charged US \$.20 for the service which had been free during the preceding season. Interest declined drastically, and only an estimated thirty farmers participated. In 1972, the third year of the campaign, TGVN intended to sell insecticide and to rent the applicators. However, interest among the farmers was very low and few applied insecticide to their crops. Despite the TGVN effort, a glance at Table 27 suggests that the campaign brought about awareness for only a few people.

Item 12: First Information Having lent a temporal perspective to this concept, I shall analyze channels and sources used to convey First Information. Item 12 asks, From whom did you receive insecticide information for the first time? (Eighty-four respondents were aware of these chemicals; the 62 who were not aware are not considered in the tabulations.) An examination of Table 28 reveals that 84% of the responses are grouped into one of three table categories. The first is the "TGVN" category. In light of the TGVN campaign beginning in 1970, it is hardly surprising that 26 farmers became aware of insecticide through the efforts of the local radio station. What is surprising is that more farmers were not made aware during the campaign, particularly since the TGVN strategy involved the use of both mass media (radio) and interpersonal (discussion and demonstration) channels utilizing localite sources. Current communication

literature suggests that combining these two channels should have helped maximize communication possibilities.

Examining the second category, the "friends, etc." category (which is actually larger than the "TGVN" category) one notices that thirty-three respondents received First Information from friends, neighbors, relatives, or on trips. Some of these farmers became aware of insecticides while working as migrant laborers on the Pacific Coast or heard about these poisons from someone else who had worked there; a few have actually applied them to the plantation owner's crops. Insecticides are widely used on certain lowland cash crops.

An examination of the third category reveals that 12 of the 84 aware respondents (14%) became aware of insecticides by listening to radio stations other than TGVN. Although these stations broadcast in Spanish, many Xepatuj farmers tune in for music, especially during the hours when TGVN is off the air. Several of the above-mentioned 12 respondents gained awareness from advertisements of particular insecticides.

Interpretation: First Information It has been shown that information is transferred through both mass and interpersonal channels, as well as by a combination of the two, at this earliest stage of awareness, First Information. That farmers report receiving information from the mass media

as well as from interpersonal channels sets this research apart from many previous communication studies in Latin America. Earlier research found that peasants did not obtain agricultural information from the mass media (c.f. the Review of the Literature). The TGVN communication strategy combines both mass and interpersonal media, which, according to the current literature, should maximize the probability of communication. The "radio except TGVN" category should, however, be regarded as a strictly mass media channel and refers to non-local radio which broadcasts in Spanish.

Turning to a brief examination of sources, it is clear that the messages of these non-local radio stations emanate from cosmopolite sources, with reference to the Xepatuj case. That is, announcers and program writers are not members of the Xepatuj audience's immediate social system. Similarly, agronomists and co-op personnel are usually cosmopolite sources, although the medium of communication is interpersonal. On the other hand, information received from friends, neighbors, relatives, and knowledge acquired during trips¹ is almost always transferred through interpersonal channels and usually is received from localite sources. TGVN

¹I make the assumption that most agricultural information learned on trips was conveyed by localite sources through interpersonal channels. Such an assumption would appear valid because most Xepatuj farmers speak only Quiche, the local language.

provides an interesting case because the source is always localite, while the medium of communication alternates between radio (mass) and interpersonal.

Later Information Of the 84 respondents who received First Information, 18 received information about insecticides on only that one occasion (see Table 29). These individuals were not asked any of the subsequent questions pertaining to insecticides. However, 66 respondents did receive more information, and the interviewers inquired about the channels and sources utilized in obtaining this Later Information.

Item 14 Item 14 asks this question: Where did you receive more insecticide information? Table 30 indicates that 84% of these Later Information responses can be grouped into three main table categories. Twenty-four farmers indicate that they have received further insecticide information from TGVN, while sixteen state that they learned more about these poisons from other radio stations. The third large category pertains to information learned from friends, neighbors, relatives, or on trips, the "friends, etc." category. The responses of 13 farmers (21%) are grouped here and the channel is, of course, interpersonal.

Interpretation: Later Information Here again the research results clearly indicate that respondents are utilizing both mass and interpersonal channels as the information-gathering process continues. Some insights about

interpersonal channels result from a comparison of Tables 28 and 30. With one exception, all categories in both tables have approximately the same cell counts. The exception is that the "friends, etc." category in Table 30 is greatly reduced from what it was in Table 28. In other words, after first learning of insecticide from "friends, etc.", a sizeable number of individuals apparently received further information from other sources--or not at all. It would appear that these farmers were able to receive First--but not Later--Information from their friends and neighbors. This suggests that an appreciable number of farmers simply lack insecticide Later Information and, therefore, have little knowledge to share with their fellows. Thus, farmers desiring insecticide Later Information may be forced to seek sources other than friends and neighbors.

Item 22: important insecticide information Item 22 asks this question: Who gave you important information about insecticides? The distribution of responses is found in Table 31. Because of the similarity between items 14 and 22 (i.e., source of further insecticide information vs. source of important insecticide information), I shall compare the responses found in the corresponding tables (viz. 30 and 31). When asked specifically about important information received (Table 31), fewer farmers mentioned non-local radio stations than in Table 30. These results may provide a clue as to the

role of non-local radio in the communication of insecticide information.

I would like to make two observations regarding Tables 30 and 31. The first, referred to immediately above, is that non-local radio stations are mentioned with somewhat less frequency when respondents are specifically asked about important insecticide sources. This is not surprising: One would not expect a large number of Quiche speakers to receive important information from a radio which broadcasts in a foreign tongue. Because of the language barrier and the likelihood that information derives from commercials, it is probable that respondents receive little practical insecticide knowledge from non-local radio stations.

The other point pertains to the "personal observation" category. In Table 30 only one person indicated that he had gained further information through personal observation; however, when asked specifically about important insecticide information, seven individuals indicated that they acquired such knowledge through personal observation. Many times during the course of the interviews, farmers stressed the importance of their own observational powers in the decision making process. Time and again respondents affirmed that they rarely risk spending money until they see for themselves that an innovation has merit: Seeing is believing. Thus, in terms of important insecticide information, it is significant that

some farmers refer to themselves as information sources--without mentioning sources which merely told them about the innovation. Another way of stating this is that many farmers (a) need to see for themselves that insect problems exist and (b) need to see the benefits of insecticide in order to be convinced of its usefulness (i.e., that the expenditure of time and money is worth the risk in a region where both are precious).

Item 18: further information It seems logical, then, that farmers seeking further insecticide information would seek people who have had experience with the chemical (see Table 32). "Users" is mentioned infrequently because few have adopted its use. However, those people believed to have had the most practical experience with these poisons are mentioned: the Novillero Cooperative (located about 10 miles from Nahuala) and TGVN, some of whose staff are known to have applied insecticide to their own crops. A significant number also believe that further insecticide information could be obtained on the Coast. It is noteworthy that further information would be sought almost exclusively through interpersonal channels. Even TGVN in this case should be seen largely as an interpersonal channel, because many respondents mentioned specific announcers whom they could consult in person.

Finally, it is significant that 12 of the 75 farmers responding to this question (16%) simply do not know where they could get more insecticide information. These farmers could not think of anyone who might have insecticide know-how and who might share this knowledge. Then too, there are the 62 farmers (c.f. Table 26) who were not asked to respond to this item because they were unaware of insecticides. These individuals, quite naturally, would not be expected to know where they could get more insecticide information. Hence, the significant number of unaware farmers--plus those who do not know where to obtain more information--is evidence of an insecticide information shortage.

Summary and conclusions Eighty-four of the 146 respondents received insecticide First Information; of these, only 66 had received insecticide information on more than one occasion. An examination of the tables indicates that Xepatuj farmers frequently acquired information via mass and interpersonal channels as well as from cosmopolite and localite sources. (If seeking further information, most respondents would seek users of an innovation and would utilize interpersonal channels with both localite and cosmopolite sources¹).

¹When discussing item 18, I concluded that TGVN should be regarded as an interpersonal channel, in this instance.

It is the frequent mention of non-local mass channels of communication which distinguishes these results from the findings of previous researchers. Social scientists have generally found that Latin American peasants rely most heavily on interpersonal channels for agricultural information. Indeed, respondents in earlier studies have consistently failed to mention mass channels as sources of agricultural information (e.g., Rogers with Svenning 1969; Deutschmann and Fals Borda 1962a).

It has been noted in the present study that station TGVN combines mass and interpersonal media and that messages emanate from localite sources. Farmers also listen to the non-local radio stations which broadcast in Spanish. Although most Xepatuj farmers speak only Quiche, some information transfer likely occurs during insecticide commercials; these are frequent and usually contain simple vocabulary and easy-to-memorize slogans. Although farmers probably receive a rather superficial insecticide knowledge from such ads, these commercial messages may create awareness.

Despite widespread utilization of various channels and sources of information, the fact remains that 43% of the respondents have never heard of insecticides. Even the three year TGVN campaign, which included demonstrations and free spraying of crops, brought only a modest number to

insecticide awareness. Why?

In seeking to resolve this question, we must look beyond a discussion of channels and sources.

Part of the answer lies in the fact that many of the farmers do not regard insects as a great threat to their crops. Many respondents indicated that the cold climate at 8,000 feet serves to control insect populations. This is a widely held opinion; indeed, only a few of the TGVN staff, themselves the community's resident change agents, regularly apply insecticide to their own crops. In sum, a significant number of Xepatuj farmers do not see a need for these chemicals. Perhaps if insect damage were highly visible and had consistently devastating effects every year, the farmers might take a different perspective. As it is, however, Xepatuj farmers do not seem to worry much about the effects of insects, except during years of pestilence.

But it may also be that the cyclical insect invasions are simply accepted phenomena of nature. Much has been written about the peasant's fatalistic world view (Sibley 1966; Rogers with Svenning 1969), and many Maya farmers may accept occasional pestilence with stoicism and passivity born of a life of calamity and misfortune. Many respondents feel that agricultural problems are acts of God which man is powerless to either prevent or remedy.

Whatever the reason for it, insect pests are apparently not a frequent topic of conversation. Yet, farmers not only discuss other pests, they actively seek to control their effects. Many farmers, in an effort to keep foraging dogs out of the cornfields, keep them tied up for weeks at a time as the harvest ripens. Others leave poisoned bait in their milpas for the dogs. Marauding bands of wild parrots noisily descend upon the cornfields in great numbers, while farmers try to frighten them away with scarecrows. A number of times during interviews a farmer would comment that while insects were no problem, did we know of a poison for the taltuzas¹? So, while dogs, parrots, and taltuzas cause farmers a good deal of consternation, insects apparently do not. Clearly, change agent and client are preoccupied about different threats to the harvest.

Furthermore, for an indeterminate number of Xepatuj farmers information sources are lacking. The cooperative is ten miles away (a very great distance if one is walking in the mountains), agronomists seldom visit the area (about once per year for short courses), non-local radio is in a foreign language (the content of the ads is sketchy, as well), and one's friends, neighbors, and relatives may all lack

¹The taltuza (Geomys hispidus) is a burrowing animal which damages corn plants. For further information, see Tax 1972:223.

information themselves. Moreover, while TGVN announcers do discuss insecticides from time to time, not everybody has access to a radio receiver; nor does everybody care to hear an insecticide lecture--especially those who see no insect problem.

So, why is it that 62 of 146 respondents are unaware of insecticides and another 18 heard them mentioned only once? Or, phrasing the question slightly differently: Why have change agents' communication strategies--which have included mass, interpersonal, and the combination of these two channels, as well as both cosmopolite and localite sources--failed to make almost half of the respondents aware of insecticides¹? The answer transcends a discussion of channels and sources.

In the first place, Xepatuj farmers do not see a need for insecticides. They would, however, like help in coping with crop losses due to dogs, parrots, and taltuzas. Since farmers perceive no insect problem, they could hardly be expected to seek solutions. Secondly, it is likely that insecticide information has been unavailable to many farmers. After all, if a man (or his friends) did not attend one of

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the relatively infrequent insecticide lectures or demonstrations nor listen to a radio lecture or insecticide commercial, he is probably unaware of the existence of insecticide. And again, to come full circle, why should he attend a lecture or listen to a broadcast if he does not believe a problem exists?

Chemical fertilizer

Item 34 Virtually everyone had received at least some fertilizer information. As indicated in Table 33, we interviewed only one farmer who was unaware of chemical fertilizer and five others who had heard about fertilizer just once. Indeed, almost half of our 146 respondents claim to have received "a lot" of fertilizer information. In sum, over 95% of Xepatuj farmers had received at least some fertilizer information.

Item 35: Later Information Item 35 asks, From whom did you receive more information regarding chemical fertilizer? (We asked this question only of people who had received information on more than one occasion.) Looking first at the interpersonal channels (as shown in Table 34), 32% of 140 respondents received further information through face-to-face interaction. Friends, neighbors, relatives, and trips played a significant role in informing 36 of the respondents, while 10 individuals received further information from an agronomist or cooperative. Interestingly,

nine individuals claim that their further information resulted solely from observing others' successes with chemical fertilizer (i.e., the "personal observation" category). If they did receive an audio stimulus as well, these farmers were so much more impressed with the visual evidence (thicker corn stalks, greener plants, larger and more abundant cobs) that they failed to mention the audio stimulus.

The evidence indicates that 20% of the respondents received information from non-local stations¹, while a much higher percentage (42%) received it from TGVN. Here, as with insecticide, TGVN mounted a chemical fertilizer campaign in which staff members combined the mass medium of radio with lectures, discussions, and demonstration projects². Table 34 shows that this radio station, which utilized mass and interpersonal channels, provided information to more people than the interpersonal mode alone or than mass media alone.

¹Contrary to what the data appear to indicate, it is likely that fewer than 20% of the respondents received chemical fertilizer Later Information from non-local stations. It is possible that some individuals heard several different fertilizer advertisements over a period of time; therefore they reported receiving Later Information from these stations. The ads actually contain little practical information.

²Along with the fertilizer TGVN introduced San Marceno seed, a high-yielding corn variety developed especially for the highland volcanic soils.

The reader must guard against inferring on the basis of this research that the combined communication strategy of mass and interpersonal media is more effective than either of the two channels alone. While the current literature asserts that the combined strategy maximizes communication possibilities, I made no effort to either prove or disprove that assertion. It must be remembered that the present study is a survey--and is not experimental in nature. Therefore, I made no attempt to control treatment error. These research results may simply reflect the fact that TGVN was more active in disseminating fertilizer information in the community than anyone else. If this is in fact the case, then one clearly may not infer that combining channels is the most effective communication strategy.

Summary and interpretation Virtually all Xepatuj farmers are aware of chemical fertilizer. Most respondents received Later Information through either interpersonal or the combined (mass and interpersonal) channels¹. Nine individuals received more information as a result of their own observation. The source in the above cases is regarded as localite (i.e., originating from within the audience's immediate social system). Twenty-eight respondents received

¹Only the TGVN strategy utilized these combined channels, as I refer to them.

Later Information from non-local radio stations, primarily from commercials. The source in this case is cosmopolite.

The communication of fertilizer information has implications which go beyond a discussion of channels and sources. It would appear that fertilizer is an example of the right innovation in the right place at the right time. As illustrated earlier in this paper, the highland Guatemala soils have been intensively farmed for years and are seriously overworked. Farmers recognize that their lands are not as productive as they were previously; they listened with interest when change agents told of a product which revitalized the earth.

Furthermore, fertilizer produced rapid and highly visible results, permitting quick verification of change agents' claims by the ever-skeptical subsistence farmers. Clearly, then, the task of increasing farmer awareness was greatly aided by the facts of widespread soil depletion and the visible advantages of fertilizer.

Compost heaps (aboneras)

Item 50 Item 50 asks the following question: Have you ever heard anything about compost heaps? The evidence indicated that 122 of 146 farmers (84%) had received at least some compost heap information. About one-sixth of the respondents were unaware of compost heaps.

Item 51 This question is as follows: After first hearing about their use, did you hear anything more regarding compost heaps? The frequency distribution appears in Table 35. Of those respondents who received First Information, eighteen heard no more about compost heaps. Most respondents (47%), however, heard a good deal more about them, while a still sizeable number received rather less information.

Item 52 This item asks, Where did you receive more information about compost heaps? (Please refer to Table 36). Most respondents gathered information from "friends, etc." or from TGVN. Once again, the TGVN staff utilized both mass and interpersonal channels; radio station staff members have conducted a number of abonera demonstrations in Xepatuj. It is thus apparent that the majority of aware farmers received compost heap information from interpersonal channels or from a combination of interpersonal and mass media. The sources should be regarded as localite.

Relatively few people gained information from the non-local radio stations, probably because they carry no compost heap advertisements. Ads, of course, are purchased by manufacturers or dealers, and no firm produces compost heaps. Respondents who heard about aboneras on these stations almost certainly received the information (whether directly or through an interpreter) from a Spanish language farm program.

Only two individuals mentioned personal observation as a source of more information. This is not surprising, because few individuals have adopted compost heaps, and one can only gather sight information after compost heaps have been constructed.

Summary and interpretation The great majority of the respondents (84%) were aware of compost heaps and over eighty-six per cent of these individuals had received further information on more than one occasion. Most farmers received this Later Information from "friends, etc." or TGVN (or from both). Fewer individuals, however, received information from non-local radio stations than for either of the previous two innovations. The reason is that these stations carry no compost heap advertisements.

Here again, as in the cases of insecticides and chemical fertilizers, it is necessary to recognize that the communication of First and Later Information has important ramifications which go beyond the concepts of channels and sources. The similarity of concept between the compost heap and what the Quiche-speaking farmers call mes (a generic term for organic matter) should facilitate information dissemination about compost heaps. The compost heap represents a simple variation on a theme for many individuals, since a number of farmers have been working manure, household garbage, and tree branches into the soil

for years in an attempt to increase productivity. Thus the concept of a compost heap represents only a slight variation from practices which are commonly known to be followed by some (i.e., while not everyone works organic matter into the soil, virtually all farmers are acquainted with the practice). In addition, unlike the chemical fertilizer case, farmers are acquainted with all of the compost heap ingredients: manure, lime, and other organic matter which often includes straw, ashes, and household garbage.

That the compost heap and mes concepts are so similar has made more difficult the data interpretation pertaining to compost heaps. I am quite certain that some respondents were referring to working mes into the soil when my referent was compost from a compost heap. With practice, the translators became well aware of the semantic distinction, but since many of the respondents were unaware, we undoubtedly made some coding errors and credited some individuals with knowledge they did not possess. For example, one respondent claimed to have a compost heap; however, when we asked to see it (as we always did), we observed that the farmer had thrown straw and tree branches into the corral, which the animals had thoroughly mixed with the manure. While this man's labor-saving innovation has much to recommend it, it was not a compost heap, at least not as change agents define one. The net result of this concept similarity is that we probably

have an inflated number of "aware" respondents.

It is apparent, however, that change agents must overcome several constraints before more farmers will seriously attend to compost heap information. In the first place, manure, a key ingredient, is in short supply.

(Ninety-two per cent of the 146 respondents have no cattle.) While manure is sold in the Totonacapan market, purchase and transportation of a modest quantity would require a full day, not to mention the monetary expenditure involved. Lack of time poses a second constraint, which should not be minimized. Xepatuj farmers, forced to find additional sources of income because of the land shortage, have relatively little free time, while compost heaps require a fair amount of maintenance: gathering materials and constructing the abonera; later, periodic watering and turning over the compost. As a third constraint, the fact that various change agents recommend different methods of compost heap preparation may significantly increase cognitive dissonance among the farmers. For example, one TGVN employee advocates the Radio Sutatenza method (see Ramirez 1973), which calls for the use of lime. Another TGVN announcer does not recommend lime during his compost heap broadcasts. Thus three compost heap constraints are lack of manure, lack of time, and conflicting information from change agents.

Section summary

In the preceding pages I discussed the communication of information regarding three agricultural innovations, examining the role of channels and sources. In the case of insecticides, I discussed the role of various channels and sources in communicating both First and Later Information; however, in the chemical fertilizer and compost heaps cases, I discussed them only with reference to Later Information. The reader will recall that First Information is equivalent to awareness and refers to the first time that an individual heard about insecticides. Later Information refers to subsequent information which the individual obtained.

It was shown that numbers of respondents who were aware of the three innovations differed considerably. Virtually all respondents were aware of chemical fertilizer while only around half were aware of insecticides. Almost 85% of the respondents were aware of compost heaps. It was noted that most individuals obtained insecticide First Information from either radio station TGVN or from friends, neighbors, relatives, or while traveling. (These latter sources comprise the "friends, etc." category.) While information from "friends, etc." is conveyed entirely through interpersonal channels, the TGVN communication strategy utilizes both interpersonal and mass channels. Each of these sources is regarded as localite in nature.

Of those individuals receiving First Information about any of the three innovations, the majority received Later Information as well. Chemical fertilizer presents the most dramatic case: 145 of 146 respondents had received First Information and all but five also heard more about this product. Eighty-six and 78 per cent of the respondents who received First Information about compost heaps and insecticides, respectively, also received Later Information.

With regard to Later Information and the three innovations, it is noteworthy that the TGVN staff members are frequently and consistently mentioned as information sources. Because this station utilizes both mass media and interpersonal channels (including lectures, discussions, and demonstrations), individuals mentioning this source could have received information from radio transmissions, from face-to-face encounters, or from both. Interpersonal localite sources ("friends, etc.") are also very frequently mentioned. Other respondents gained Later Information from non-local radio stations, which can be categorized as mass media with cosmopolite sources. This information is derived mainly from fertilizer or insecticide advertisements and is not of a highly technical nature. Other less frequently mentioned sources of information included agricultural technicians (agronomists and co-op personnel) as well as personal observation of the results which others obtained.

I turn now to a discussion of the roles of the various channels and sources regarding the three agricultural innovations. First, with regard to the mass media, it is clear that the non-local stations, which broadcast in Spanish, are much listened to by Xepatuj farmers. Because TGVN is on the air only in the early mornings and again after 4 PM, many people listen to music on the non-local stations when TGVN is not broadcasting. Consequently, they are exposed to the heavy radio advertising, including ads for fertilizers and insecticides. (There are no compost heap ads.) Because these advertisements contain simple Spanish vocabulary and easy-to-memorize jingles, many people can gather information from them. However, because most farmers lack fluency in Spanish and because the ads contain little technical information, farmers do not gain practical knowledge about agricultural innovations from the non-local radio stations¹.

TGVN staff members, with a combined mass and interpersonal information strategy, have conveyed Later

¹It is possible that a few Xepatuj farmers may gain information by listening to non-local radio agricultural programs. Few farmers, however, have the language background or the desire to do this. It also appears that a large percentage of these broadcasts pertain to cash crops grown on the Pacific coastal plain, rather than to food crops grown in the highlands.

Information to more Xepatuj farmers than any other sources¹. Because TGVN broadcasts in Quiche (and the Cakchiquel language, as well) farmers have no language barrier to obstruct comprehension, as in the case of the non-local stations. By utilizing interpersonal channels (lectures, discussions, demonstrations) as well as radio, TGVN should be able to convey more detailed information than would be possible with radio alone.

Let us now consider the role of interpersonal channels with localite sources in communicating Later Information. Included in this category are friends, neighbors, relatives, and information learned on trips². All of these are frequently mentioned as sources of Later Information (cf. Tables 30, 34, and 36). It is probably true, however, that these sources lack detailed information regarding the three innovations.

A small but significant number of farmers mention gaining chemical fertilizer information by their own

¹TGVN has undoubtedly also conveyed First Information to many; however, except for the case of insecticides (Table 28), we collected no data on TGVN's role in bringing about awareness.

²There is the possibility that some information gained on trips is learned from cosmopolite sources (e.g., Ladino straw bosses on the plantations). It was not possible to determine whether such is the case. The fact that few Ladinos speak Quiche would tend to obstruct interpersonal communication with Xepatuj farmers, however.

observation (cf. the "personal observation" category, Table 34). Information is more easily acquired by such personal observation if an innovation's effects are easily visible. Such is the case with chemical fertilizer; but insecticide, for example, does not usually have such clearly discernible effects in the highlands.

I turn now to a consideration of interpersonal channels with cosmopolite sources. Government agronomists (e.g., from INTECAP), and co-op personnel were the sources mentioned in this category. They are also the most highly specialized of the information sources. However, agronomists and co-op personnel rarely visit the Nahuala area, and even less frequently do they communicate directly with the Xepatuj farmers.

The research data appear to indicate that whether Xepatuj farmers attend to messages regarding innovations is a function of much more than simply channels and sources. I have mentioned several such factors which have acted to impede awareness of the three innovations. Given the presence of such constraints, farmers may tend to "tune out" change agents' messages. Involved specifically are the self-protective exercises of selective exposure, selective perception, and selective retention (Klapper 1969:19).

It has been suggested that messages which do not address the farmer's "felt needs" may not be "heard." While many

farmers perceive the need to control the effects of dogs, parrots, and taltuzas in the cornfield, for example, many fewer believe it necessary to further control the effects of insects.

I have also suggested that Xepatuj farmers tend to disregard those innovations which do not hold the promise of quick and visible results (e.g., insecticides).

It is clear that farmers must receive pertinent and comprehensible information about an innovation if their knowledge is to increase. At least some Xepatuj farmers do not receive such messages. This is rather graphically illustrated by the fact that farmers received much more insecticide and chemical fertilizer later information from non-local radio advertisements than from agronomists and co-op personnel.

The Factor Analysis

My purpose in this section is to discuss the factor analysis of the data. I shall present an analysis of insecticide and chemical fertilizer relative to the factor results. I will not discuss compost heaps because of the preponderance of correlated errors evidenced in this factor. Suggestions for further research are presented with the discussion, as well as a modified adoption model.

Insecticide

As pointed out earlier, the items in the factor which pertain to these poisons form an aware/unaware dimension of insecticide due to the phenomenon of correlated error. (The aware category in this section actually combines First and Later Information.) The reader will be better able to judge the potential effect of correlated error by referring to Appendix A and observing how each of the variables was coded.

The data suggests that farmers who are aware do not receive insecticide information exclusively from one channel or from only one source. Factor 1 indicates that aware farmers receive information from mass channels (items 83, 90, 88, 89, 84, 97) as well as from interpersonal channels (item 65a). Furthermore, these same aware farmers tend to receive insecticide information from cosmopolite (98, 65a, 87) as well as localite (82, 83) sources. Thus, farmers who are aware of insect poisons tend to receive insecticide information from both channels as well as from both sources¹.

Previous research in Latin America shows that subsistence farmers received agricultural information almost

¹It is particularly true with insecticides that information is largely unavailable from friends and neighbors in Xepatuj. Many are simply unaware of its existence. Nor is it usually possible for a farmer to see for himself the effects of insecticide on bugs--even if it were widely used in the area. It is little wonder, then, that many farmers mention mass media and cosmopolite sources.

exclusively from interpersonal localite sources (Deutschmann and Fals Borda 1962a; Rogers with Svenning 1969). Xepatuj farmers seem to have had much more contact with mass media and cosmopolite sources of agricultural information than Latin American respondents surveyed by researchers in the early and middle sixties. But are Xepatuj farmers' communication habits substantially different from those of other present-day Latin American subsistence farmers? Perhaps Xepatuj farmers differ because of the presence of a local radio station. Or, is any difference accounted for by the fact that the earlier research took place ten or more years ago and that media opportunities have changed in the interim?

These questions can be resolved only by cross-national and cross-cultural comparative studies. Such research of subsistence farmers' communication habits is urgently needed, particularly because at least some change agents seem to believe that mass channels of information are seldom utilized by peasant farmers. Educacion Basica Rural is attempting to answer some of these questions. This organization is presently evaluating the effectiveness of radio in communicating agricultural information to Guatemalan subsistence farmers. (They have not yet published their findings.) Clearly, however, more research is needed.

Of course, access to information is prerequisite to information transfer, and I believe that more Latin American

peasants have access to communication channels and sources of agricultural information than had access a decade ago. Years ago Spector et al. (1963) carried out their communication experiments under exceptional conditions in Colombia: few peasants had been exposed to the test instruments (radio programs, motion pictures, and slide sets). Rogers with Svenning (1969) found a few years later that not one peasant respondent mentioned a mass medium as a source of agricultural information. Such is no longer the case. And yet it would seem that while more subsistence farmers probably do have access to mass media and cosmopolite sources than a decade ago, there still appears to be a significant number who take advantage of neither the mass/interpersonal channels nor the localite/cosmopolite sources.

There are three main reasons why I believe that Xepatuj farmers do not utilize such channels and sources of agricultural advice. Future researchers may wish to examine these. First, there seems to be a significant group of farmers who do not receive agricultural advice from any source. Factor 6 suggests that those farmers who receive agricultural advice from relatives also tend to get farm advice from friends, printed matter, agronomists, and radio. Conversely, farmers who do not get farm advice from relatives also tend not to get advice from other sources. Thus, some farmers apparently do not receive agricultural information

from anyone.

This notion assumes added significance when one examines factor 1. The positive correlation of items 26, 24, 25, 53, and 37 shows that people who are aware of any one agricultural innovation tend to be aware of the other two as well. Conversely, people unaware of any of the innovations tend to be unaware of the others as well. This configuration, like factor 6, may imply that some farmers simply do not receive agricultural information. (The main difficulty in interpretation is that the factor emerged in spite of the fact that hardly anyone was unaware of chemical fertilizer.) The interviewers' personal impressions (which are consistent with my own) are that a number of farmers do not desire agricultural information or advice from anyone, including friends or relatives. Some farmers do not seek advice from relatives, friends, and neighbors, for example, because these latter sources are not trusted¹. Such localite sources are sometimes thought to be uninformed or are suspected of deliberately passing mis-information in an attempt to cause harm to a neighbor's crop.

¹Ruth Bunzel's observations (1952:53) about Chichicastenango may also apply to neighboring Nahuala: "The relationships in which one would logically expect reciprocity, as between brothers, are just the relationships that are characterized by hostility, rivalry, and mutual suspicion. This applies, though with less intensity, to neighbors, also."

Secondly, selective perception, retention, and exposure may help explain why some do not seem to get agricultural advice. Cases such as the following are seen frequently in the field: Several farmers mentioned to me that they had acted on advice, received from change agents, which had detrimental effects on their crops. For this reason these farmers planned to stay with "tried and true" methods of agriculture.

Rumor is a related phenomenon about which little is known. To what extent do Xepatuj subsistence farmers distort change agents' messages¹?

Thirdly, some farmers apparently lack opportunity to receive agricultural information. This group, as I suggested earlier, is thought to be fairly large. Change agents need more information regarding the parameters of this group because development messages obviously cannot be received by subsistence farmers who lack opportunities to hear them.

Interestingly, the data indicate that for some farmers who are given the opportunity, exposure to a channel or

¹One might put an analogous question to change agents: To what extent does the "expert" distort the situation and misunderstand the weltanschauung of the Xepatuj farmer? To what extent should a stranger in a strange land prescribe agricultural innovations to mediate a situation which he believes to be untenable? Given the fact that few non-indigenous change agents speak more than a few words of greeting in Quiche, is not such distortion inevitable?

source is associated with a favorable evaluation of the advice received. For example, factor 7 shows a strong correlation between time spent listening to radio (item 88) and the belief that one obtains good advice from radio (item 82). Analogously, factor 9 shows a correlation between speaking personally with a visiting agricultural technician (item 65a) and obtaining good agricultural advice from agronomists (item 87). Frey (1966:192) found similar relationships in his own research and concluded that "heightened exposure to the media in general and especially to the specific medium involved goes hand in hand with a more favorable evaluation of the media on the whole and that specific medium in particular." To what extent are channel and source exposure associated with their favorable evaluation by Xepatuj farmers?

Chemical fertilizer

Unlike the insecticide and compost heap innovations, factor 2, which is one of three fertilizer factors to emerge, contains an applied/not applied dimension. The data (items 98, 97, 90, 35) show that farmers who apply chemical fertilizer to both corn and wheat tend to have the following characteristics: adopters tend to speak Spanish, to be acquainted with several radio stations, to live with literate relatives, and to have received fertilizer information from higher order sources.

It seems to me that these characteristics represent an education dimension and I think it likely that an association exists between fertilizer application and education. Of course, further research is necessary to determine whether the dimension does represent education. But, assuming that my interpretation is justified, several exciting research questions would remain. The first is, does education cause fertilizer adoption? (Remember, since factor analysis is really correlation, the fact that two variables are associated in the same factor does not imply causation.) And if it does, what can be done to bring about and enhance this education among subsistence farmers?

It would also be important to determine whether an education dimension which correlated with application (perhaps even causing it) were associated with formal educational curricula. I suspect a lack of association with formal education for two reasons. In the first place, much of the formal curriculum is often not relevant to subsistence farmers. As Herrera Munoz (1971:6) of the Guatemala Ministry of Education puts it, "education has lost its prestige in many communities because the children do not learn useful things, and such a situation induces people to believe that school attendance is useless" (translation, mine). (See also, CENDOC 1976; Early 1973:223; Vogt 1969:193.) Secondly, while this dimension which emerged (and which may represent

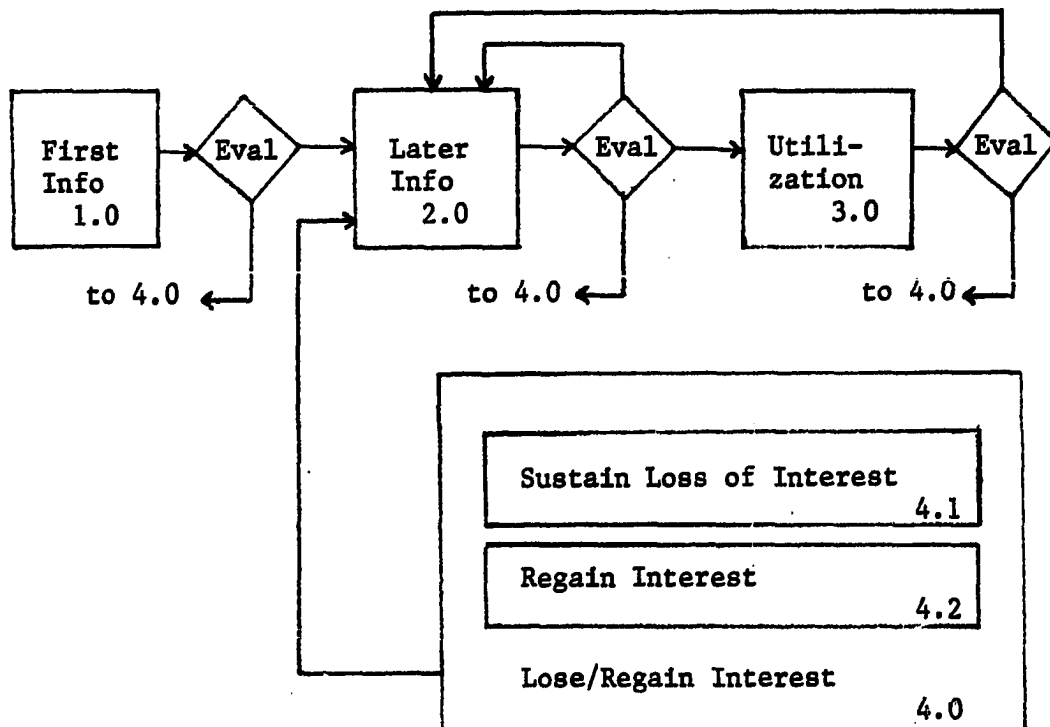
education) correlates with application, formal education does not. Therefore, application is independent of formal education. Indeed, formal education variables did not load on any of the factors. It is most interesting, in this regard, that radio schools did not load, since agricultural programs are intended to promote the application of non-traditional technology. However, any conclusions regarding education and application based on this exploratory research would be premature.

Factor 2 also appears to manifest three stages of the traditional Adoption Process Model. I refer to what could be construed as application (items 43, 44), knowledge (items 34, 37, 35), and evaluation (38, 46, 47) dimensions. The knowledge dimension would correspond to the model's Awareness and Interest stages. In the Interest stage, the individual "develops interest in the innovation and seeks additional information about it" (Rogers et al. 1971:100).

Of significant interest is what my results imply about the Evaluation stage of the model. In this stage of the traditional model, the individual "makes mental application of the new idea to his present and anticipated future situation and decides whether or not to try it" (Rogers 1971: 100). However, the psychologist Allen Edwards (1959) advises that it is almost impossible to absorb any fact without evaluating it. Thus, it may be that evaluation, rather than

occurring at only one stage of the model, occurs at every stage. That is to say, adoption in Xepatuj might be better explained by dropping evaluation as an independent stage and including it at every stage of the process.

Such a modified adoption process model might be conceptualized as follows:



The model depicts the almost continuous processes of gaining knowledge and making evaluation. At his discretion, a farmer can lose interest and leave the process at any time. (He can also re-enter at any time.) Or, he may continue to acquire and possibly utilize information, while constantly evaluating it.

The reader has noticed that utilization of an innovation is sustained by continually gathering and evaluating further information. The Xepatuj peasant farmer is in no position to spend time or money on projects without constantly monitoring his real or potential gain as a result of utilization. This monitoring activity is itself a source of Later Information.

The present research has been concerned wholly with communication and not at all with adoption. Nevertheless, I substituted utilization for adoption in the modified model, due to the connotations of this last term. Adoption in the traditional Adoption Process Model is seen as the final stage in a five stage process. However, the Xepatuj subsistence farmer does not practice permanent, uncritical adoption of agricultural technology. For example, while many farmers used fertilizer consistently before the price skyrocketed in 1974, almost all of them "lost interest" in this product when they could no longer afford it. Perhaps if the price becomes affordable in the future, some farmers will "regain interest" in chemical fertilizer.

While this revision seems to improve upon the traditional model with regard to Xepatuj, let it be said one last time that my discussion of agricultural communication has presupposed message relevancy and utility to the small farmer. Future communication researchers must give much more attention to message content rather than assume, as we tend to do, that the message content is necessarily "good" for peasant farmers.

Indeed, Charles Posner, writing in New Scientist, argues that some agronomists' messages in Guatemala bode ill for that nation's development and for peasant farmers in particular. Agronomists, he contends, insist that large-scale farming is more efficient than the family farm and that specialization yields a higher return than integrated farming. Such a policy can only seal the fate of the subsistence farmer. Posner believes that channels and sources of agricultural information become irrelevant when the agronomist undermines his own credibility with these farmers:

The failure of this approach in Guatemala has destroyed the possibility of securing the peasants' cooperation or acceptance of advice no matter how well presented from outside sources.... The new agronomy must prevent the deagriculturisation of Latin America... (Posner 1975:31).

Summary

The factor analysis of the data revealed that Xepatuj farmers use a variety of channels and sources for obtaining agricultural information. Indeed, this evidence contrasts strikingly with research results reported by others in Latin America.

Nevertheless, while some Xepatuj farmers are acquiring information from various channels and sources, others may be utilizing them little or not at all. I posited three reasons which might account for such underutilization.

The chemical fertilizer data contain the only applied/not applied dimension in the analysis. This dimension is associated with what has been tentatively identified as an education dimension. Education, as it appears here, is apparently not associated with the formal school curriculum.

The factor analysis also suggested the necessity for modification of the traditional Adoption Process Model. An alternative was presented.

Tables 14 - 36

Following are the tables cited in this chapter:

Table 14. Public school attendance?

item 99	frequency	percentage
did not attend	98	67
did not complete any grade	3	2
completed grade 1	6	4
completed grade 2	10	7
completed grade 3	12	8
completed grade 4	8	6
completed grade 5	2	1
completed grade 6	6	4
missing values	1	1

	146	

Table 15. Radio school attendance?

item 91	frequency	percentage
never attended	117	80
less than 1 year	8	6
1 year	10	7
2 years	4	3
3 years	5	3
4 years	2	1

	146	

Table 16. Number readers in the home?

item 97	frequency	percentage
none	54	37
1	41	28
2	29	20
3	14	10
4	4	3
5	2	1
6	1	1
7	1	1

	146	

Table 17. Favorite radio programs?

item 89	frequency	percentage
does not listen	29	20
music only	38	26
combinations not including educational programs	8	6
educational programs	63	43
	--	
	138 ¹	

¹ 8 respondents were either not asked or their responses uncoded

Table 18. Books used in radio school?

item 92	frequency	percentage
did not attend	110	75
Laubach and/or Juan I - IV	20	14
Amanecer	5	3
Missing values	11	8

	146	

Table 19. Spoke with visiting technician?

item 65a	frequency	percentage
no	128	88
yes	14	10
missing	4	3

	146	

Table 20. Good farm advice from relatives?

item 82	frequency	percentage
no	94	64
sometimes	23	16
almost always	29	20

	146	

Table 21. Good farm advice from radio?

item 83	frequency	percentage
no	54	37
sometimes	29	20
almost always	63	43

	146	

Table 22. Good farm advice from print?

item 84	frequency	percentage
no	128	88
sometimes	7	5
almost always	11	8

	146	

Table 23. Good farm advice from friends?

item 85	frequency	percentage
no	100	69
sometimes	24	16
almost always	22	15

	146	

Table 24. Good farm advice from salesmen?

item 86	frequency	percentage
no	128	88
sometimes	9	6
almost always	9	6

	146	

Table 25. Good farm advice from agronomist?

item 87	frequency	percentage
no	126	86
sometimes	7	5
almost always	13	9

	146	

Table 26. Heard about insecticides?

item 10	frequency	percentage
no	62	43
yes	84	58

	146	

Table 27. When heard about insecticides for first time?

item 11	frequency	percentage
does not recall	4	5
1975	7	8
1974	21	25
1973	17	20
1972	10	12
1971	7	8
1970	6	7
1969	2	2
1968	3	4
before 1968	8	9
	--	
	85 ¹	

¹ 61 respondents were either not asked or their responses uncoded

Table 28. From whom received insecticide First Information?

item 12	frequency	percentage
does not recall	3	4
personal observation	3	4
friends, neighbors, relatives, trips	33	39
TGVN	26	31
agronomist, co-op	7	8
radio, except TGVN	12	14
	--	
	84 ¹	

¹ 62 respondents were either not asked or their responses uncoded

Table 29. Heard about insecticides more than once?

item 13	frequency	percentage
no	18	21
yes, a little	33	39
yes, a lot	33	39
	--	
	84 ¹	

¹ 62 respondents were either not asked or their responses uncoded

Table 30. From whom heard more about insecticides?

item 14	frequency	percentage
does not recall	3	5
personal observation	1	2
friends, neighbors, relatives, trips	13	21
TGVN	24	38
agronomist, co-op	6	10
radio, except TGVN	16	25
	--	
	63 ¹	

¹ 83 respondents were either not asked or their responses uncoded

Table 31. Who provided important insecticide information?

item 22	frequency	percentage
does not recall	2	3
personal observation	7	10
friends, neighbors, relatives, trips	14	20
TGVN	25	36
agronomist, co-op	9	13
radio, except TGVN	12	17
	--	
	69 ¹	

¹ 77 respondents were either not asked or their responses uncoded

Table 32. Where could get further insecticide information?

item 18	frequency	percentage
does not know	12	16
users	4	5
friends, neighbors, relatives, trips	12	16
TGVN	30	40
agronomist, co-op	13	17
radio, except TGVN	4	5
	--	
	75 ¹	

¹ 71 respondents were either not asked or their responses uncoded

Table 33. Heard about chemical fertilizer more than once?

item 34	frequency	percentage
no	5	3
yes, a little	69	47
yes, a lot	71	49
	--	
	145 ¹	

¹ 1 respondent was not asked

Table 34. From whom heard more about chemical fertilizer?

item 35	frequency	percentage
does not recall	1	1
personal observation	9	6
friends, neighbors, relatives, trips	36	25
TGVN	59	42
agronomist, co-op	10	7
radio, except TGVN	28	20
	--	
	143 ¹	

¹ 3 respondents were either not asked or their responses uncoded

Table 35. Heard about compost heaps more than once?

item 51	frequency	percentage
no	18	15
yes, a little	48	39
yes, a lot	58	47
	--	
	124 ¹	

¹ 22 respondents were either not asked or their responses uncoded

Table 36. From whom heard more about compost heaps?

item 52	frequency	percentage
does not recall	4	3
personal observation	2	1
friends, neighbors, relatives, trips	32	22
TGVN	52	36
agronomist, co-op	11	8
radio, except TGVN	9	6
	--	
	110 ¹	

¹ 36 respondents were either not asked or their responses uncoded

SUMMARY

This exploratory research has examined the communication of agricultural information among Xepatuj subsistence farmers near Nahuala, Guatemala. Specifically, I investigated information diffusion pertaining to three agricultural innovations: insecticides, chemical fertilizer, and compost heaps.

Communication channels and sources of this agricultural information were investigated. A channel is the communication medium used to transfer a message to the audience. Two channel categories were introduced: mass media and interpersonal channels. A source is the originator of the message which is conveyed by a channel. Sources were defined as cosmopolite and localite. Cosmopolite sources do not belong to the receiver's social system, while localite sources do.

The author had intended to incorporate the Adoption Process Model into the research. This model, developed in the midwestern United States, posits the existence of a five stage innovation decision making process: awareness, information, evaluation, trial, and adoption. However, once in the field, the author decided that the Adoption Process Model did not satisfactorily explain adoption in the community under study. (Other research questioning the validity of the model was cited.) I modified the traditional

model in an attempt to improve its explanatory power in the Xepatuj case.

The research was conducted in Guatemala's western highlands, among Quiche-speaking Mayan Indians. Descendents of the great Mayan empire, most Maya today are subsistence farmers. Confronted by a rapidly rising population and an increasingly acute land shortage, these farmers are unable to produce enough food to sustain their families. This population/food/land crisis has forced farmers to till hitherto undesirable land, such as steep mountain slopes, and to overwork their more desirable holdings. The net result of such agricultural practices has been decreasing yields, a phenomenon first remarked upon in the literature at least forty years ago.

In order to survive, most highland subsistence farmers have extra-farm employment. Cottage industry provides an income supplement for some. Many highland locales in western Guatemala are well known for specific products. For example, farmers around Nahuala specialize in hewing grinding stones and in weaving.

Seasonal migrant labor on the large plantations of the piedmont and Pacific coastal plain provides another income supplement for many. These latifundia generally produce coffee, cotton, or sugar for export. While living and working conditions on these plantations are often inadequate, the

meager wage is enough to attract highland farmers by the thousands year after year.

La Voz de Nahuala (TGVN), a local educational radio station, provides agricultural education to Maya listeners in two indigenous languages. Adhering to an educational model established in 1947 by Colombia's Radio Sutatenza, TGVN has established radio schools in outlying villages. Besides offering instruction in agriculture, the radio school curriculum provides language training (both in the indigenous languages and in Spanish) and the traditional range of subjects: math, health, and civics.

Xepatuj, the locus of the present study, lies within this highland region. It is a rural community of about 200 families located within the township of Nahuala and adjacent to the town proper. These rural farmers plant mainly corn, although many sow wheat and/or potatoes as well.

For purposes of this research, farmers are defined as those people who make decisions regarding the cultivation of land. (This land might be owned, rented, communal, or borrowed.) The decision makers were most often older males; however, in a few cases the mantle of authority had fallen to the wife or to a teenaged son.

The research utilized techniques of survey sampling, and bilingual (Quiche, Spanish) research associates assisted the research team in conducting 146 interviews, each lasting

about an hour. These interviews generally took place in farmers' homes.

Data processing was completed at Iowa State University. Frequency tables were generated on each of the variables. On the basis of a grand correlation matrix (160 variables), I deleted most variables which were not intercorrelated ($< .5$ or $.6$) with at least two others. A factor analysis was performed on the 57 variables which remained.

Previous communication research in Latin America, influenced the design and implementation of this study. Both interpersonal and mass channels have intrinsic advantages and disadvantages with regard to the other in terms of optimum response to a message. Mass media, for example, are useful in conveying information rapidly to a large number of people, while interpersonal communication is more likely to bring about attitude change. With the recognition of strengths and weaknesses of the mass and interpersonal channels separately, it is common in diffusion projects to combine these channels in order to maximize the impact upon the audience. Radio forums and the Latin American radio schools have traditionally combined these channels.

Messages from both channels are always perceived in a culturally selective manner. One's perceptions are a function of complex cognitive organizations: belief, social ideals, morals, cultural frames of reference.

In this research I introduced the concepts of First and Later Information. First Information is equivalent to awareness in the traditional adoption model and refers to the first time that an individual heard about an innovation. Later Information refers to all subsequent information which an individual obtains and does not correspond to a particular stage in the Adoption Process Model.

It was shown that numbers of respondents having initial awareness (First Information) of the three innovations differed considerably. Virtually everyone was aware of chemical fertilizer while only around half were aware of insecticides. Almost 85 per cent of the respondents were aware of compost heaps. Most individuals obtained insecticide First Information from either radio station TGVN or from friends, neighbors, relatives, or while traveling. (First Information data was not collected for the chemical fertilizer and compost heap innovations.)

Of those individuals receiving First Information about any of the three innovations, the majority received Later Information as well. It is noteworthy that TGVN staff members are frequently and consistently mentioned as sources of Later Information. Because this station utilizes both mass media and interpersonal channels (including lectures, discussions, and demonstrations), individuals mentioning this source could have received information from radio transmissions, from

face-to-face encounters, or from both. Thus, the mass channel has become a personal medium in Xepatuj.

Interpersonal localite sources are also very frequently mentioned. Included in this category are friends, neighbors, relatives, and information learned on trips in the highlands. These sources probably lack detailed information regarding the three innovations. There is some reason to believe that mutual mistrust and suspicion among Xepatuj residents inhibits intra-group communication of agricultural information.

Other respondents gained Later Information from non-local radio stations. This information is derived mainly from fertilizer or insecticide advertisements and is not of a highly technical nature.

Far fewer farmers received agricultural information from visiting agricultural technicians (e.g., agronomists and co-op personnel). It is with such sources that local farmers have had the least contact. However, the TGVN staff has greatly benefited from these agricultural specialists.

My results--in contrast to those of earlier researchers--clearly show that mass channels provide agricultural information to many Xepatuj farmers. Specifically, I refer to local and non-local radio stations. (Few have had contact with the celluloid and print media.) Although the non-local stations broadcast in Spanish, some of

the primarily non-Spanish-speaking Xepatuj farmers apparently glean information from advertisements. The local radio station staff (TGVN), utilizing a combined mass and interpersonal information strategy, have conveyed Later Information to more Xepatuj farmers than has any other source. The evidence does show, however, that the TGVN radio schools have reached directly only a few Xepatuj farmers per year.

Very importantly, the data suggest that whether Xepatuj farmers attend to messages regarding innovations is a function of much more than simply channels and sources. I indicated several factors which have served to impede awareness of the three innovations. Given the presence of such constraints, farmers may tend to "tune out" change agents' messages. Involved, among other strategies, are the self-protective exercises of selective exposure, selective perception, and selective retention.

The factor analysis of the data revealed that Xepatuj farmers use a variety of channels and sources for obtaining agricultural information. Indeed, this evidence contrasts strikingly with research results reported by others in Latin America who suggest that peasants almost always utilize interpersonal channels with localite sources.

Nevertheless, while some Xepatuj farmers are acquiring information from various channels and sources, others may be

utilizing them little or not at all. I posited three reasons which might account for such underutilization.

The chemical fertilizer data contain the only applied/not applied dimension. This dimension is associated with what has been tentatively identified as an education dimension. Education, as it appears here, is apparently not associated with the formal school curriculum.

The factor analysis also suggested the necessity for modification of the traditional Adoption Process Model. An alternative was presented.

Suggestions for further research were made in the factor analysis subsection of the Discussion chapter.

APPENDIX A

The Questionnaire

I present the questionnaire in this Appendix. The questions appear in Spanish exactly as they did on the field instrument. The selectors were translated into English during the process of re-coding the questionnaire after the completion of the field survey. (This process is described in the Method of Procedure chapter.) In the interest of avoiding further possibilities of translation error, the selectors were not re-translated back into Spanish.

The reader will notice that the following items were coded almost identically: 12, 14, 18, 22, 35, and 52. This was done to facilitate inter-item comparisons. In every case, the selectors are ranked according to the presumed quality of the source's information. It was assumed that agronomists, for example, provided higher quality agricultural information than friends; consequently, respondents mentioning agronomists as sources received a higher code.

I selected each individual's highest order response for each item and weighted the response according to its hierarchical location. For example, if a person received chemical fertilizer Later Information from friends, TGVN, and an agronomist, I selected the highest order response (agronomists) and assigned the corresponding code. These codes were then key punched onto IBM cards.

Ranking and selecting the highest order response did result in some lost information, however. The data would have been cleaner had I treated the responses according to either of two alternative schemes. The first would have involved simply tabulating the frequency with which each selector was mentioned. The other alternative would have involved asking the respondent to list the "most important information source." This alternative would have yielded only one response. Either of these alternatives would have resulted in more reliable data for the several items involved.

1. HORA EMPEZO
 2. ENTREVISTADO
 3. ENTREVISTADOR
 4. FECHA
 5. NUMERO DE VISITA A LA CASA DE ESTE SENOR
 6. ES UD. EL QUE TOMA LAS DECISIONES SOBRE LA SIEMBRA, ABONAMIENTO, CULTIVO, Y COSECHA DE SUS SIEMBRAS?
 7. HACE CUANTOS ANOS QUE UD. TOMA DECISIONES SOBRE SU TERRENO?
 8. CUALES SON LOS CULTIVOS QUE UD. SIEMBRA EN FORMA INTERCALADA?
00. was not asked
01. blank

- 02. does not intercalate
- 03. corn and abeja or corn and potato
- 04. corn and haba
- 05. corn and frijol
- 06. corn, frijol, and haba
- 07. corn, haba, frijol, and squash

9. TIENE UD. PROBLEMAS CON INSECTOS EN SUS CULTIVOS?

- 00. was not asked
- 01. blank
- 02. is not certain
- 03. never has problems
- 04. sometimes has problems
- 05. always has problems

INSECTICIDAS

10. EN SU VIDA, HA OIDO ALGO ACERCA DE INSECTICIDAS?

11. CUANDO FUE LA PRIMERA VEZ QUE UD. OYO ALGO DE INSECTICIDAS?

- 00. not asked
- 01. blank
- 02. does not remember
- 03. 1975
- 04. 1974
- 05. 1973
- 06. 1972
- 07. 1971
- 08. 1970
- 09. 1969
- 10. 1968
- 11. before 1968

12. DE QUIEN RECIBIO UD. ESTE INFORMACION POR PRIMERA VEZ SOBRE INSECTICIDAS?

- 00. was not asked

- 01. blank
 - 02. Do not use this score.
 - 03. does not remember
 - 04. personal observation
 - 05. neighbors, friends, relatives, elsewhere in highlands
 - 06. TGVN
 - 07. agronomist, cooperative, cosmopolite extension agents (e.g., INTECAP), gremial, organized meeting
 - 08. any radio station(s) other than TGVN
- Code highest order response

13. DESPUES DE LA PRIMERA VEZ QUE UD. OYO DEL USO, HA OIDO ALGO MAS DE LAS INSECTICIDAS?

- 00. was not asked
- 01. blank
- 02. no
- 03. yes, a little
- 04. yes, a lot

14. DE DONDE RECIBIO MAS INFORMACION DE INSECTICIDAS?

- 00. not asked
- 01. blank
- 02. received no more information
- 03. does not recall
- 04. personal observation
- 05. neighbors, relatives, elsewhere in highlands
- 06. TGVN
- 07. agronomist, cooperative, cosmopolite extension agents (e.g., INTECAP), gremial, organized meeting
- 08. any radio station other than TGVN

15. QUE QUIERE DECIR INSECTICIDA PARA UD?

- 00. was not asked
 - 01. blank
 - 02. does not know
 - 03. combat "plaga," plant medicine, fumigate corn, kill animals harmful to corn
 - 04. kill worms, fight insects and disease
 - 05. kill bugs harmful to crop
- Code highest order response.

16. CONOCE UD. AGRICULTORES QUIENES USAN INSECTICIDAS EN NAHUALA?

- 00. was not asked
- 01. blank
- 02. no
- 03. yes

17. CUALES INSECTICIDAS CONOCE UD?

- 00. was not asked
- 01. does not know any or item left blank
- 02. mentions 1
- 03. mentions 2
- 04. mentions 3

18. DONDE PUEDE CONSEGUIR OTRO INFORMACION SOBRE INSECTICIDAS?

- 00. not asked
- 01. blank
- 02. does not know
- 03. Do not use this score.
- 04. from users
- 05. friends, neighbors, relatives, trips in highlands
- 06. TGVN
- 07. agronomist, cooperative, cosmopolite extension agents (e.g., INTECAP), gremial, organized meeting
- 08. any radio station(s) other than TGVN

19. EN SU VIDA, HA PENSADO USAR INSECTICIDAS?

Same code as for question 13.

20. QUE SERIAN UNAS VENTAJAS PARA UD. DE USAR INSECTICIDAS?

Items not coded because responses very similar to those given for question 15.

21. CREE UD. QUE HAY ALGUN PELIGRO EN USAR INSECTICIDAS?

- 00. not asked
- 01. blank
- 02. no danger
- 03. uncertain if there is danger
- 04. probable danger
- 05. indebtedness as a danger
- 06. danger to crops
- 07. Do not use this score.
- 08. Do not use this score.
- 09. danger to person
- 10. some combination of dangers (e.g., harmful to land and people)

22. QUIEN LE CONTO INFORMACION IMPORTANTE SOBRE INSECTICIDAS?

Same coding as question 14.

23-25. APLICO UD. INSECTICIDAS ESTE AÑO A SU (23) MILPA, (24) TRIGO, (25) PAPA?

- 00. was not asked
 - 01. blank
 - 02. did not plant
 - 03. did not apply
 - 04. did apply; To how many cuerdas?
- The three crops received the same codification.

26-28. APLICO INSECTICIDAS A SU (26) MAIZ, (27) TRIGO, (28) PAPA?

- 00. was not asked
- 01. blank
- 02. Do not use this score.
- 03. has never applied insecticide
- 04. applied once to at least one crop
- 05. applied at least two years to same crop (not necessarily consecutively)

- 29-31. PLANEA APLICAR INSECTICIDAS EL PROXIMO AÑO A SU (29)
MAIZ, (30) TRIGO, (31) PAPA?

This item was not coded.

FERTILIZANTES

32. EN SU VIDA, HA OIDO ALGO ACERCA DE ABONO QUIMICO?

Only one respondent had not heard of chemical fertilizer; therefore, this item was not coded.

33. QUE QUIERE DECIR ABONO QUIMICO PARA UD?

- 00. not asked
- 01. blank
- 02. Do not use this score.
- 03. not very effective
- 04. Do not use this score.
- 05. does not know
- 06. Do not use this score.
- 07. sometimes gives results
- 08. Do not use this score
- 09. vague answer but one indicating some favorable feeling about chemical fertilizer
- 10. Do not use this score
- 11. improve harvest; helps plant
- 12. Do not use this score
- 13. helps corn grow
- 14. Do not use this score.
- 15. helps wheat
- 16. Do not use this score.
- 17. for corn and wheat
- 18. Do not use this score
- 19. helps soil
- 20. Do not use this score.
- 21. combinations of more than one positive response

34. DESPUES DE LA PRIMERA VEZ QUE UD. OYO DEL USO, HA

OIDO MAS DE ABONO QUIMICO?

- 00. not asked
- 01. blank
- 02. no
- 03. yes, a little
- 04. yes, a lot

35. DE QUIEN RECIBIO MAS INFORMACION ACERCA DE ABONO QUIMICO?

Same coding as question 14.

36. CONOCE UD. AGRICULTORES QUIENES USAN ABONO QUIMICO EN NAHUALA?

- 00. was not asked
- 01. blank
- 02. no
- 03. yes

37. CUALES FORMULAS DE ABONO QUIMICO CONOCE UD?

- 00. was not asked
- 01. blank
- 02. does not know any
- 03. mentions at least one of the "abonos completos" (A)
- 04. mentions at least one from the "nitrogenado/fosforo" group (B)
- 05. mentions at least one from the "nitrogenado" group (C)
- 06. mentions a fertilizer from A and B
- 07. mentions a fertilizer from A and C
- 08. mentions a fertilizer from B and C
- 09. mentions a fertilizer from A, B, and C

38. EN SU VIDA, HA PENSADO USAR ABONO QUIMICO?

- 00. was not asked
- 01. blank

- 02. no
- 03. yes, a little
- 04. yes, a lot

39. QUE SERIAN UNAS VENTAJAS PARA UD. DE USAR ABONO QUIMICO?

Same coding as question 33

40. CREE UD. QUE HAY ALGUN RIESGO EN USAR ABONO QUIMICO?

- 00. not asked
- 01. blank
- 02. no danger
- 03. uncertain if there is danger
- 04. probable danger
- 05. debt, indebtedness
- 06. danger to crops
- 07. bad weather
- 08. danger to land
- 09. danger to person
- 10. some combination of dangers
- 11. land becomes dependent

41-42. EN TOTAL, QUE CANTIDAD DE ABONO QUIMICO ECHO?

- 00. not asked
 - 01. blank
 - 02. did not plant
 - 03. planted crop but did not apply fertilizer
 - 04. applied fertilizer
- This data was collected for both the 1974 and 1975 wheat (41) and potato (42) crops.

43-45. EN QUE ANOS APLICO ABONO QUIMICO A SU (43) MAIZ, (44) TRIGO, (45) PAPA?

Items 43 and 44 were coded as follows:

- 00. not asked
- 01. blank
- 02. not applied
- 03. Do not use this score.

- 04. one year of use
- 05. two years of use
- 06. three years of use
- 07. more than three years of use

Item 45 was coded as follows:

- 00. not asked
- 01. blank
- 02. not planted
- 03. not applied
- 04. applied once
- 05. applied at least twice

46-48. PLANEA APLICAR ABONO QUIMICO EL PROXIMO AÑO A SU
(46) MAIZ, (47) TRIGO, (48) PAPA?

- 00. not asked
- 01. blank
- 02. has never planted crop
- 03. no
- 04. uncertain
- 05. yes

49. USO ABONO NATURAL EN SUS CULTIVOS ESTE AÑO?

- 00. not asked
- 01. blank
- 02. did not use manure
- 03. used manure

ABONERA (FOSO DE ABONO, CONFOST)

50. EN SU VIDA, HA OIDO ALGO ACERCA DE ABONERAS?

- 00. Do not use this code.
- 01. blank
- 02. no
- 03. yes

51. DESPUES DE LA PRIMERA VEZ QUE UD. OYO DEL USO, HA OIDO ALGO MAS ACERCA DE ABONERAS?

- 00. not asked
- 01. blank
- 02. no
- 03. yes, a little
- 04. yes, a lot

52. DE DONDE RECIBIO MAS INFORMACION ACERCA DE ABONERAS?

Same coding as questions 14 and 35.

53. QUE SON LOS INGREDIENTES EN UNA ABONERA?

- 00. was not asked
- 01. blank; does not know any ingredients
- 02. mentions 1 ingredient
- 03. mentions 2
- 04. mentions 3
- 05. mentions 4

54. CONOCE UD. AGRICULTORES QUE USAN ABONERAS EN NAHUALA?

- 00. not asked
- 01. blank
- 02. no
- 03. yes

55. EN SU VIDA, HA PENSADO HACER UNA ABONERA?

- 00. not asked
- 01. blank
- 02. no
- 03. yes, a little
- 04. yes, a lot

56. CUALES SERIAN UNAS VENTAJAS PARA UD. TENER UNA ABONERA?

- 00. not asked
- 01. blank
- 02. Do not use this code.
- 03. no advantage
- 04. Do not use this code.
- 05. is not sure
- 06. Do not use this code.
- 07. sometimes gives results
- 08. Do not use this code.
- 09. vague answer but one indicating favorable feeling about compost
- 10. compost cheaper than chemical fertilizer
- 11. improves harvest; helps plant
- 12. Do not use this code.
- 13. helps corn grow
- 14. as good as or better than chemical fertilizer
- 15. Do not use this code.
- 16. carry-over effect for the following year
- 17. Do not use this code.
- 18. Do not use this code.
- 19. improves the soil
- 20. Do not use this code.
- 21. any combination of more than one positive response (07 or higher)

57. CREE UD. QUE HAY PELIGRO AL APLICAR ABONO DE UNA ABONERA?

Same code as question 40.

58. EN QUE ANOS HIZO UD. ABONERAS?

- 00. was not asked
- 01. blank
- 02. Do not use this code.
- 03. never made one
- 04. made one
- 05. made at least two

59. TENDRA UNA ABONERA EN EL PROXIMO ANO?

- 00. not asked
- 01. blank
- 02. no
- 03. uncertain
- 04. yes

PRESTAMOS

60. PRESTO DINERO PARA LAS COSECHAS ESTE ANO? DONDE?

- 00. not asked
- 01. blank
- 02. did not borrow
- 03. borrowed from family
- 04. borrowed from friend or neighbor
- 05. borrowed from money lender or from labor contractor
- 06. borrowed from cooperative

61. ES DIFICIL PARA UD. PRESTAR DINERO?

- 00. not asked
- 01. blank
- 02. does not know
- 03. very difficult
- 04. sometimes yes, sometimes no
- 05. not very difficult
- 06. easy

62. CREE UD. QUE HAY ALGUN RIESGO EN PEDIR DINERO PRESTADO PARA LOS CULTIVOS?

- 00. not asked
- 01. blank
- 02. does not know
- 03. much risk

- 04. a little risk
- 05. no risk

AYUDA TECNICA

63. EN LOS ULTIMOS ANOS HA CAMBIADO SU MANERA DE CULTIVAR?

- 00. not asked
- 01. blank
- 02. no
- 03. yes

64. QUIEN LE ACONSEJO HACER EL CAMBIO?

Same code as for question 14. However, "no more information" does not apply.

- 65A. HABLO PERSONALMENTE CON ALGUN TECNICO QUIEN VISITO NAHUALA?

- 00. not asked
- 01. blank
- 02. knows of no technicians visiting Nahuala
- 03. no
- 04. received knowledge from another who spoke to technician
- 05. yes

- 65B. CONSIDERA UD. IMPORTANTE LA VISITA DE ALGUN AGRONOMO?

- 00. was not asked
- 01. blank
- 02. is not certain
- 03. no
- 04. yes

66. A QUIEN BUSCA CUANDO UD. QUIERE DISCUTIR UN PROBLEMA

AGRICOLA?

- 00. not asked
- 01. blank
- 02. does not seek anyone
- 03. there is no place to ask
- 04. someone with experience
- 05. friends, neighbors, relatives
- 06. TGVN
- 07. agronomist, salesperson, pharmacist

- 67-69. CUANTAS CUERDAS SEMBRADAS TIENE EN (67) PROPIAS, (68) ALQUILADAS, (69) COMUNALES?

We also asked how many cuerdas the respondent had in corn, wheat, and potatoes.

- 70-78. TIENE UD. UNOS (70) CABALLOS, (71) MULAS, (72) VACAS, (73) TOROS, (74) CABROS, (75) GALLINAS, (76) CONEJOS, (77) OVEJAS, (78) CERDOS? CUANTOS?

These items were all combined in one score: total farm animals.

79. HA IDO ESTE AÑO A UNOS DE LOS SIGUIENTES LUGARES?

The interviewer inquired about visits to eleven of the larger highland communities and Guatemala City.

80. ADEMÁS DE SUS CULTIVOS, QUE OTRO TRABAJO HACE UD?

This item was not coded.

81. ES POSIBLE QUE UN JOVEN AGRICULTOR PUEDA SUPERARSE AQUÍ?

This item was not coded.

COMUNICACION

- 82-87. OBTIENE UD. BUENOS CONSEJOS PARA SU TRABAJO AGRICOLA DE ALGUNOS DE LOS SIGUIENTES? (82) PARIENTES, (83) RADIO, (84) MATERIAL IMPRESO, (85) AMIGOS O VECINOS, (86) VENDEDOR, (87) AGRONOMO

Each item is coded as follows:

- 00. not asked
- 01. blank
- 02. does not know
- 03. no
- 04. sometimes
- 05. almost always

88. CUANTAS HORAS DIARIAS OYE RADIO?

- 00. not asked
- 01. does not listen
- 02. listens up to two hours
- 03. listens 2-4 hours
- 04. listens 4.1 - 6 hours
- 05. listens 6.1 or more hours

89. QUE CLASE DE PROGRAMA LE GUSTA MAS?

- 00. not asked
- 01. blank
- 02. does not listen
- 03. music only
- 04. any combination not including educational programs
- 05. educational programs; any combination which includes educational programs

90. CUANTAS EMISORAS DE RADIO CONOCE?

- 00. not asked

- 01. blank
- 02. lists 0
- 03. lists 1
- 04. lists 2
- 05. lists 3
- 06. lists 4

91. POR CUANTO TIEMPO ASISTIO EN UNA ESCUELA RADIOFONICA?

- 00. not asked
- 01. blank
- 02. never attended
- 03. attended less than a year
- 04. attended one year
- 05. code = years attended plus 5

92. QUE LIBROS APROBO EN LA ESCUELA RADIOFONICA?

- 00. not asked
- 01. blank
- 02. did not attend
- 03. attended but did not finish any books
- 04. does not recall title; Laubach; Juan I-IV
- 05. C'ac' C'aslemas
- 06. Amanecer
- 07. Seguimiento

93. A CUALES GRUPOS ORGANIZADOS PERTENECE UD? (COMO COOPERATIVA, GRUPO DEPORTIVO, ETC.)

- 00. not asked
 - 01. blank
 - 02. belongs to no group
 - 03. sports group; marimba group
 - 04. Do not use this code.
 - 05. cofradia or Accion Catolica
 - 06. pro-fiesta; pro-Virgin
 - 07. Do not use this code.
 - 08. business group (e.g. Tejedores Comerciantes)
 - 09. cooperative; credit and savings group
- In case of combinations, code highest order response.

94. CUANDO ACOSTUMBRA UD. SALIR A TRABAJAR EN LA COSTA?

- 00. not asked
- 01. blank
- 02. does not go to coast
- 03. used to go but not any more
- 04. travels to coast

95. CUANTOS ANOS TIENE UD.?

- 00. not asked
- 01. blank
- Code= age + 2

96. CUANTOS HIJOS VIVOS TIENE UD?

- 00. not asked
- 01. blank
- 02. has no children
- 03. 1 child
- 04. 2 children
- 05. 3 children
- 06. 4 children
- 07. 5 children
- 08. 6 children
- 09. 7 or more children

97. CUANTAS EN LA CASA SABEN LEER?

- 00. not asked
- 01. blank
- 02. nobody reads
- 03. 1 reader
- 04. 2 readers
- 05. 3 readers
- 06. 4 readers
- 07. 5 readers
- 08. 6 readers
- 09. 7 readers

98. HABLA UD. ESPANOL?

- 00. not asked
- 01. blank
- 02. no
- 03. some
- 04. yes

99. FUE UD. A LA ESCUELA? CUAL FUE EL ULTIMO GRADO QUE CURSO?

- 00. not asked
- 01. blank
- 02. did not attend
- 03. did not complete any grade
- 04. grade 1
- 05. grade 2
- 06. grade 3
- 07. grade 4
- 08. grade 5
- 09. grade 6

100. CUANTAS PERSONAS VIVEN EN SU CASA?

- 00. not asked
- 01. blank
- Code = number of occupants + 1

101. VIVE OTRO EN LA CASA QUIEN TOMA DECISION SOBRE OTRA TIERRA?

If the response was affirmative, this individual was also interviewed.

APPENDIX B

Suggestions for Change Agents

This research has treated the communication of three agricultural innovations in Xepatuj, near Nahuala, Guatemala. From my experience of two summers in Nahuala I have formed several notions regarding change agent strategies. I would like to share some of these thoughts as suggestions to present and future change agents in this locale.

1. A compost heap campaign could likely be successful. Local farmers are well aware that their soils are overworked and that crop production has been decreasing over the years. In addition, the compost heap is not an alien technique and does not represent a radically new agricultural concept (as insecticide does, for example).

The compost heap is a variation of a familiar agricultural theme: applying organic refuse to the soil. Animal manure is, however, an uncommon local resource. Change agents might alleviate this scarcity by purchasing a quantity of dried manure in a not-too-distant animal market (e.g., San Francisco el Alto). The estiercol could then be transported to Nahuala for re-sale to local farmers.

2. The persuasive value of highly visible demonstration projects cannot be overemphasized. (Strategists must reckon with the area's pattern of geographically disbursed settlement when locating the demonstrations.) Xepatuj farmers

have little reason to risk their meager resources in order to follow a change agent's "hypothetical" advice. Many respondents indicated that change agents often only provide theoretical solutions to local agricultural problems. The difference between unproved hypothesis and empirical evidence is important to the subsistence farmer. Even the relatively isolated Xepatuj farmer has seen numerous change agents come and go--while, on balance, they have done little to ameliorate a deteriorating agricultural situation. Change agents must prove the worth of their hypotheses through empirical demonstration.

3. Change agents must become cognizant of and work within the bounds of community mores and the local power structure. Genuine rapport with community leaders is often much more helpful than a government minister's letter of introduction. Indeed, many farmers do not conceal their suspicion and hostility toward the government.

4. Change agents should take care that their innovations have ecological validity and will not jeopardize the subsistence farmer's already precarious survival. The promotion of insecticides is a case in point. Many of these poisons available in Guatemala have been banned in more technologically developed countries. Change agents might contemplate the long range effects of insecticide use not only to the land but to human health, as well.

A second relevant example may be the promotion of petroleum-derived agricultural products. Chemical fertilizers, for example, can only be expected to increase in price as the world's oil reserves diminish. Encouraging subsistence farmer dependence on such increasingly expensive technology is unsound.

5. Individual Kapatuj farmers attend more to certain communication channels and sources than to others. Not only do farmers have varying predispositions regarding these channels and sources, but access to agricultural information also varies in the community. In order to reach the widest possible audience, change agents should consider several information delivery systems. In addition to demonstration projects, they might seek the support and assistance of selected mass media, the clergy, the schools, and local leaders.

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