INNOVATION DIFFUSION AND DEVELOPMENT IN A THIRD WORLD SETTING: THE COOPERATIVE MOVEMENT IN SIERRA LEONE[1]

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ALTHOUGH THE STUDY OF INNOVATION DIFFUSION IS RELEVANT TO OUR understanding of the broader processes of economic development and social change, the link between these two concerns generally has been neglected from both a knowledge and policy perspective. One of the reasons may be that traditional innovation diffusion theory specifies this link in narrowly defined terms largely involving only communications strategies. The theory employed here, however, focuses upon the supply rather than the demand side of the diffusion and gives particular attention to the role of organizational entities employing a multiplicity of strategies to bring about change.

The innovation diffusion used to elaborate this theory is that of agricultural cooperatives in Sierra Leone, West Africa. These cooperatives are of many different types, but two, marketing and thrift and credit societies, comprised about 95% of the total number in the mid-1960s. The popularity of the thrift and credit cooperatives lay in the fact that they were relevant to a wide slice of the rural population, including a high proportion of women and less well-off people who sold privately grown crops in small quantities. The marketing cooperatives also were highly accessible, including many small-scale agriculturalists in their membership (Riddell, 1970). These provided economies of scale for individual farmers that enabled low cost, high-yield production via mechanical cultivation; the marketing of products at substantially higher prices through bulk selling; and, in general, increased access to resources and the means of production. In a broader context, cooperatives acted as an

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important accelerator for economic development by supporting productive investment, eliminating some middleman functions, and successfully abolishing the high rural indebtedness caused by the existing money lending system (Karr and Bangura, 1968; Riddell, 1970).

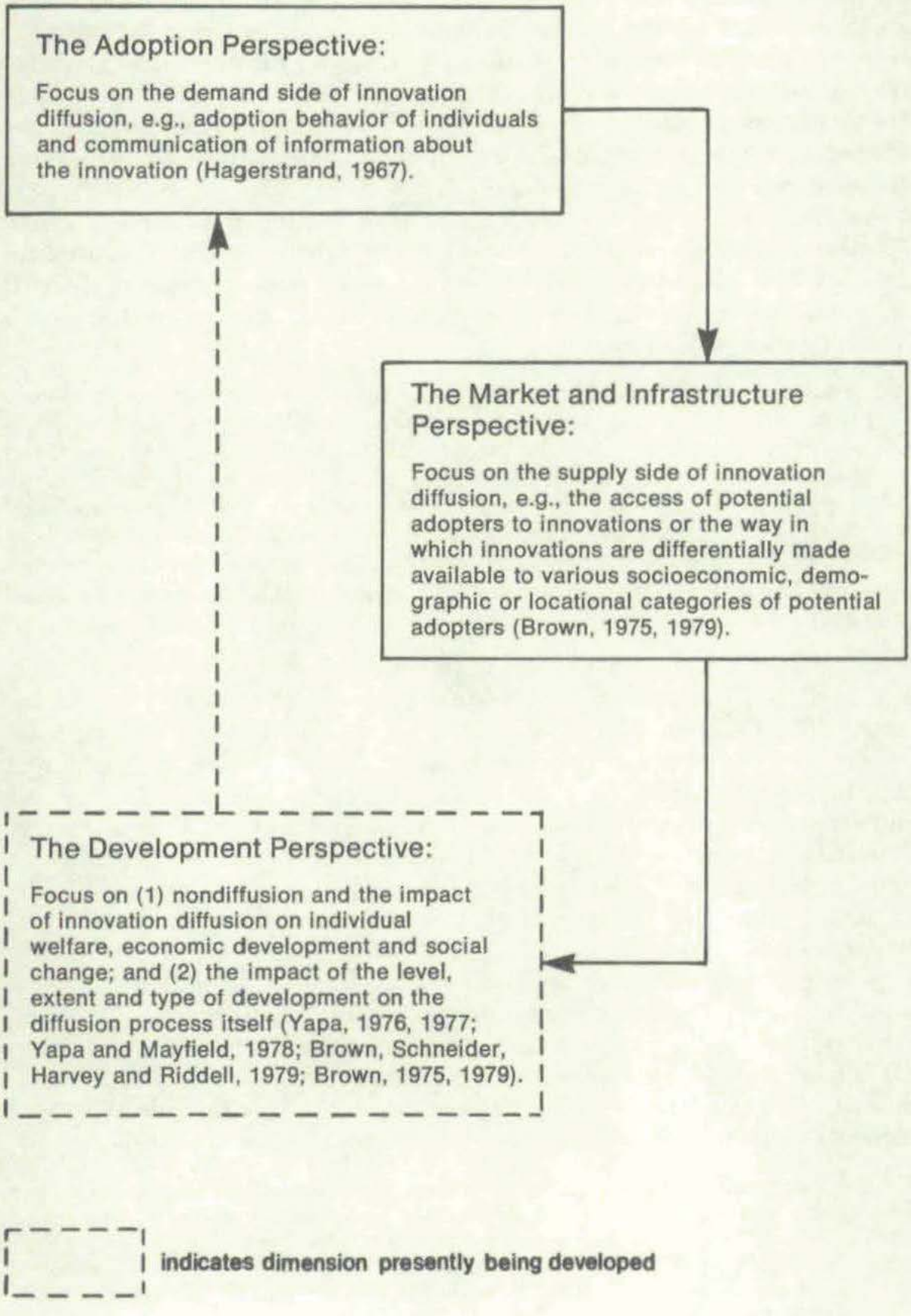
A conceptual framework for this study is set forth in the following section. Attention is then turned to elements of the historical development of the cooperative movement in Sierra Leone which are important for understanding the processes underlying that diffusion. The temporal and spatial patterns of diffusion are discussed in the fourth section, and the fifth section reports statistical analyses that assess (1) which variables provide a basis for distinguishing political units with cooperatives from those without, and (2) which variables account for the differences in the time at which cooperatives were established. The final section summarizes the findings, integrates them with the theory presented, and reflects on the implications of the study.

CONCEPTUAL FRAMEWORK OF THE STUDY

Contemporary models of innovation diffusion incorporate three dimensions (Figure 1). One of these, which constitutes the traditional approach to innovation diffusion, focuses on adoption (Rogers and Shoemaker, 1971) and emphasizes the role of communications (Hagerstrand, 1967). More recently, attention has turned to the steps that occur prior to adoption, the market and infrastructure perspective on innovation diffusion (Brown, 1975) (Figure 1). One of these steps is the establishment of diffusion agencies (agricultural cooperatives in the present context) through which the innovation is distributed to the population at large. In addition, each agency implements a strategy to induce adoption in its service area which, together with the activities of other entities that facilitate adoption, has been termed establishment of the innovation.

Within the context of this framework, adoption may be viewed as the demand side of diffusion. Alternatively, diffusion agency and innovation establishment, aspects of the diffusion process that control the availability of the innovation to potential adopters and their access to it, represent the supply side of diffusion (Brown, 1975). To elaborate, the location of diffusion agencies and the time order of their establishment determine where and when the innovation will be available, thus providing the outlines of the spatial pattern of diffusion. Further detail is contributed by the operating procedures of each agency and the characteristics of the relevant public and private infrastructure such as service, delivery, information, transportation, electricity and water systems. These create different levels of access to the innovation depending upon the economic, locational and social characteristics of the potential adopter. Accordingly, shifting attention to the agency instead of the adopter is important from both a policy and knowledge perspective.

Figure 1: Dimensions of Contemporary Geographical Work on Innovation Diffusion



The implications of this framework are interesting when considered in the context of economic and social development of Third World nations, the third dimension of contemporary geographical models of innovation diffusion (Figure 1). On the one hand, the characteristics of public and private infrastructures that play an important role in innovation diffusion are themselves related to the level of development. More interesting, however, are the ideas representing a reaction to the fact that the diffusion of technological innovations generally has not led to large-scale economic development within Third World nations but, instead, has tended to increase regional inequalities and widen the disparities between social and economic classes.

An explanation for this has been set out by the dependency school (Gonzalez, 1965; Frank, 1967; Sunkel, 1969). They argue that spatial inequality and the marginality of peripheral or poorer regions (internal colonies) are the inevitable consequences of their position in the development process. Specifically,

> these regions are linked in a satellite relationship to dynamic national centers, which in turn are linked in an external dependency relationship with dynamic foreign centers. The poor peripheral regions, therefore, form the bottom rung in an exploitative system which brings development to the metropolitan economies by draining the poor areas of their economic surplus. . . . And since incumbent political and socio-economic elites are also the beneficiaries of the dependency relationship, little compensatory action can be expected from national governments. (Gilbert and Goodman, 1976:121)

These observations are relevant to the most common development strategy based on the concept of the dual economy (Furtado, 1964; Morawetz, 1974; Oshima, 1971; Ho, 1972).[2] This holds that development depends upon an interplay between traditional and modern sectors aimed at expanding the latter. In this context, the occurrence of entrepreneurship is seen as particularly critical but hindered by traditional norms. Therefore a complete change of attitudes, behavior and values through education is essential, and an important mechanism of this change is the communication and diffusion of new ideas and practices, as in the traditional adoption-oriented model of innovation diffusion (Rogers, 1969). One aspect of this is the transference, through media or impersonal communications, of modernization impulses from the urbanized Western-oriented parts of the population to more traditionally oriented rural areas. On a more local scale, professional change agents, innovative individuals and opinion leaders accelerate adoption and economic development through demonstration effects and interpersonal communications.

[2] This approach involves an emphasis on large-scale industries. An alternative development strategy that has received significant attention in recent years involves a focus on rural nonfarm sector activities. This attributes great importance to stimulating small-scale, rural-based economic activities in intermediate and smaller towns and their hinterlands. For a general account, see Anderson and Leiserson (1978), Gordon (1978) and Liedholm and Chuta (1976).

In addition to information and personal characteristics of potential adopters, however, diffusion and entrepreneurship are affected by individual access to the means of production and public goods or the availability and distribution of resources by government, entrepreneurial or nonprofit institutions.[3] This aspect is addressed by the dependency school, but also relevant on a more modest scale is the market and infrastructure perspective on diffusion (Brown, 1975; Yapa, 1976). This perspective views the social, economic and locational variance in the availability and distribution of resources as facilitating adoption for some individuals or households and not others. The result is intensification of the already existing social, economic and locational disparities so that diffusion waves of development are simultaneously nondiffusion waves of underdevelopment.

The consideration of this perspective in a policy context leads to some important observations. First, it suggests that development policy must be formulated so as to recognize that all three factors taken together—the personal attributes of potential adopters, information and resources—constitute the conditions for the adoption of innovations and entrepreneurship. Generally, policies (and research) have emphasized the first two factors and neglected resources. Only recently has consideration been given to questions such as which resources are most relevant, how their distribution might be improved, and which innovations are most effective for development given the present-day distribution of resources in Third World countries.[4] Particularly important in this latter consideration is whether an innovation benefits workers or entrepreneurs or, for entrepreneurs, whether it benefits large-scale or small-scale operations. Those favoring entrepreneurs and particularly large-scale entrepreneurial operations lead to a greater degree of nondiffusion and an increase in economic disparities among households (Yapa, 1976, 1977; Yapa and Mayfield, 1978).

Policy concerns such as these are illustrated by the agricultural cooperative in Sierra Leone, the mechanism of development examined here. Two questions might be considered within the above framework. One is the adoption of the cooperative by individual users and the innovation establishment strategies related thereto. Another question is the spread of the cooperative itself, a problem in diffusion agency establishment. It is to this second question that attention is now turned.

Agricultural cooperatives in Sierra Leone were established independently by different sets of individuals in different locales. However, the

[3] Examples of resources include information; capital or access to capital through loans; public infrastructures such as transportation, electricity or water systems; and public facilities providing service, collection, delivery or processing related to the innovation or its implementation.

[4] For examples of resource-oriented research see Havens and Flinn (1970, 1975), Bordenave (1977*a*,*b*), Yapa (1976, 1977) and Yapa and Mayfield (1978). Development strategies that focus on rural nonfarm activities (Anderson and Leiserson, 1978; Gordon, 1978; Liedholm and Chuta, 1976) also are resource oriented.

government provided incentives and impulses to induce cooperative establishment in a systematic fashion that favored some areas more than others. Accordingly, the system of diffusion agencies and the gross pattern of diffusion represent the aggregation of individual actions and decentralized decision making as orchestrated by the central propagator. With regard to the particular factors related to agency establishment in such circumstances, economic considerations concerning profitability or market potential are important, but appear to operate as threshold, rather than ordering, conditions. Given these conditions, agency establishment is primarily related to the exposure of the founding individual to the innovation. Through this the individual learns of the opportunity to establish a diffusion agency, the ways in which this can be done, and the gains to be expected from the venture. Thus, establishment of a diffusion agency in a decentralized decision-making setting with central propagator support is itself an adoption process (Brown, 1975).

This conceptualization implies that the spatial and temporal patterns of the diffusion of agricultural cooperatives in Sierra Leone should reflect the information linkages and related means of exposure to the innovation, the need for or relevance of agricultural cooperatives in a given locale, the entrepreneurship or innovativeness of the population in a given locale, and the interaction between these and the propagation efforts of the government. These conjectures are now explored further in a brief historical account.

HISTORICAL ELEMENTS IN THE DIFFUSION OF COOPERATIVES IN SIERRA LEONE

The cooperative movement was initiated in the 1930s when the Department of Agriculture organized a few societies in the northern provinces with the purpose of promoting rice cultivation and marketing. These cooperatives resulted in greater quantities of high-quality output that obtained up to 28% higher prices in the export market than would have been achieved in local trade. Consequently, farmers in surrounding areas demanded the creation of cooperatives, resulting in a contagion type of diffusion. This was aborted by World War II when markets were cut off, and even the existing cooperatives ceased functioning (Johnston, 1968:114–15).

In 1946 a group of educated Africans formed the Sierra Leone Organization Society in an effort to revive the cooperative movement. Although this group both spread the concept of cooperative action and established cooperatives in remote districts, the cooperatives tended to exist as independent entities without affecting surrounding areas (Johnston, 1968:116–18).

Sustained growth of the cooperative movement began in 1948 with the appointment of a Registrar of Cooperative Societies and the creation of the Department of Cooperatives in 1949. Both had the function of actively promoting cooperative development and greatly accelerated coop-

erative establishment. An even greater increase occurred between 1952 and 1955 with the government policy of accelerated expansion that created training programs for cooperative personnel (Johnston, 1968:171). Nevertheless, development was dampened by capital scarcity and a lack of qualified personnel to meet the demand for cooperatives (Bangura, 1965). For these reasons only selected parts of the country were assisted in cooperative development, primarily where the authorities believed cooperatives had the best prospects of solving regional problems and where the demand was greatest. Also, the Department of Cooperatives preferred to promote cooperatives in areas adjacent to already established societies to make the most efficient use of the limited personnel. Thus, the area expansion of cooperatives occurred only as fast as staff availability permitted (Johnston, 1968:168), and the expansion that did occur tended to be focused on several core areas from which there was only a gradual spread outward.

These core areas of focus were dominated by the Mende people. This may be entirely fortuitous, owing to their location in the geographic areas that were environmentally suitable to the specific cash crops the government propagators had decided to encourage. It also may represent favoritism, owing to the fact that the African positions in the colonial and postcolonial government were dominated by the Mende. In any case, whether intrinsically correct or not, the Mende were regarded as more receptive to modernization, or more innovative, than other ethnic groups. This quality has been attributed in part to their long contact with the commercial activities of Lebanese traders in the cash-crop regions, and it is supported by the observation that many Mende chiefs played a direct role in molding the population's receptivity to cocoa cultivation and the new cooperatives (Van der Laan, 1975:58).[5]

In terms of process, then, the Cooperative Department and other government entities served as central propagators, at least encouraging cooperative establishment in selected areas where the utility and receptivity toward cooperatives were believed to be greatest. This led to an initial clustering of cooperatives in southern and southeastern Sierra Leone, where the Mende people dominated and where climate, terrain and other ecological conditions were conducive to cash-crop agriculture. Within this constraint, the spread of information about cooperatives through interpersonal communications also was important in molding the receptivity of the population.

PATTERNS OF COOPERATIVE DIFFUSION

This section first considers the temporal trends of cooperative diffusion and then turns to their spatial manifestations. In the latter effort, the unit

[5] Some, like Paramont Chief Kai Samba I, went as far as evicting several Lebanese from their chiefdoms so as to reduce competition for the new cooperatives (Van der Laan, 1975:59).

of analysis is the district, a regional subdivision of Sierra Leone comprised of several chiefdoms, the smallest nonurban administrative unit. Data are available for chiefdoms, but generally there are not enough cooperatives per chiefdom to discern temporal and spatial trends.[6]

The temporal trend in cooperative establishment for the whole of Sierra Leone may be interpreted either as conforming to the S-curve empirical regularity or as representing a more linear trend (Figure 2*A*).[7] In viewing such graphs for the district level, however, the S-curve is more evident (Figure 2*B*). There are two apparent inflection points—in the middle 1950s and in the early 1960s. These correspond with two government efforts to promote cooperative action and to train cooperative personnel, the first from 1950 to 1955 and the second initiated in 1960 (Johnston, 1968: 149).

These graphs also indicate a significant variation in the time order of adoption among districts and more particularly that the districts of south and southeast Sierra Leone, compared to other parts of the country, established cooperatives earlier and had established more cooperatives by 1967. To gain further insight into the spatial pattern of diffusion, a series of maps for selected years was prepared (Figure 3). The early diffusion in the southern and southeastern districts of Kailahun and Pujehun apparently occurred because of their favorable ecological conditions for cash crops and because they are areas where the Mende influence was extremely strong. The importance of both of these factors is further illustrated by the fact that there is a significantly smaller number of cooperatives established once the diffusion wave moves beyond the borders of the areas of major Mende concentrations into areas dominated by the Temne and into areas of higher elevation, a surrogate for ecological suitability for cash-crop agriculture.

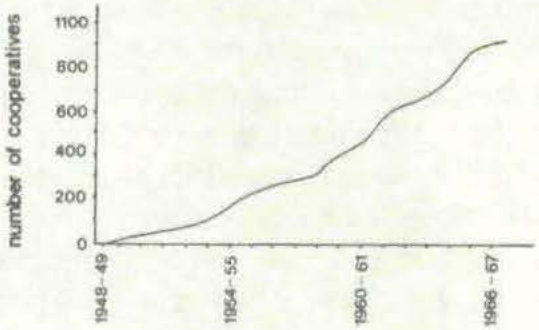
More generally, there appear to be two different nodes (Pujehun and Kailahun) from which a wavelike or neighborhood type of diffusion pattern emerges. A hierarchical pattern of diffusion is of course not expected, since we are dealing with an agricultural innovation and areas with primarily lower-order centers. Yet it is noteworthy that the origins of the cooperative movement are in areas that are located rather far from Freetown, the capital city. It would not be unreasonable to hypothesize otherwise, that is, that even though the innovation is only relevant for rural areas it might be more likely to originate in the rural hinterland of Freetown or of another major urban center. Instead, if there is a hierarchy effect at all, it is a reverse one directed from more rural areas towards less rural areas in proximity to the major city.

[6] Data on the founding and location of cooperatives at both the district and chiefdom level were collected by Riddell, one of the authors of this paper. These data at the district level are available in Riddell (1970).

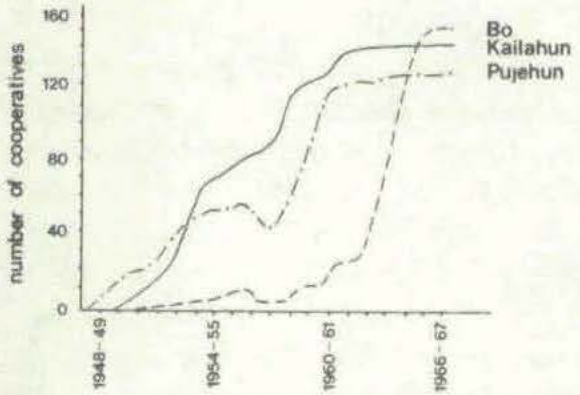
[7] For a discussion of the S-curve regularity, see Hagerstrand (1952), Casetti (1969) or Brown and Cox (1971).

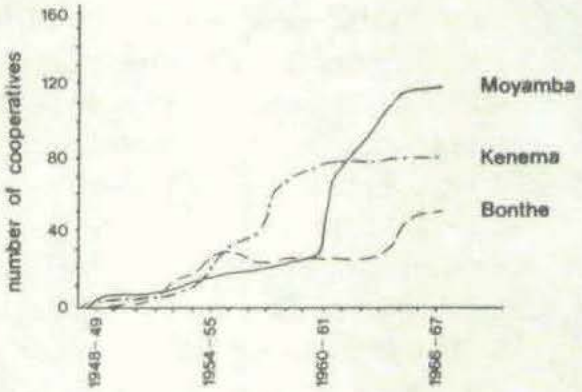
Figure 2: The Growth of the Cooperative Movement in Sierra Leone [A] and by District [B], 1948 - 1967

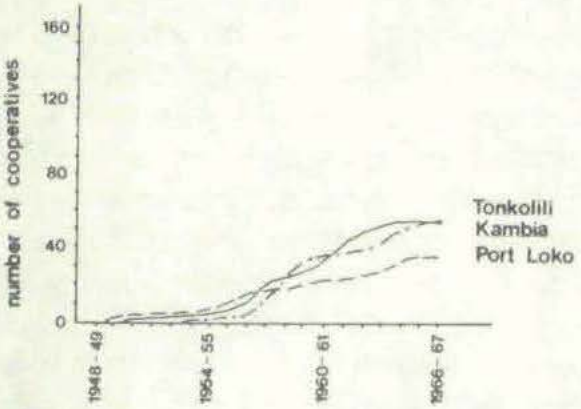
[A]

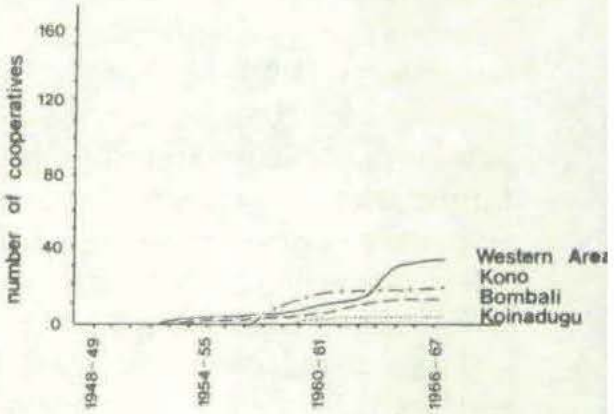


[B]









THE PROCESS OF COOPERATIVE DIFFUSION

The cartographic and historical analyses of the preceding sections indicate that more agricultural cooperatives are found in areas with lower relief, a high percentage of Mende population, and a location in proximity to the original diffusion nodes of Pujehun and Kailahun. To develop this lead in greater detail, two questions are addressed. First, what variables are related to a chiefdom having or not having at least one agricultural cooperative? The second question only pertains to those chiefdoms with cooperatives and asks what variables are related to the time at which the initial cooperative was established in each chiefdom.

To address the first question, a two-group discriminant analysis is employed, one group being chiefdoms with cooperatives (adopters) and the other those without (nonadopters). The time order of cooperative or diffusion agency establishment is addressed via multiple regression analysis in which the dependent variable is the years since the first cooperative was established in each chiefdom.

Independent Variables. Both analyses use the same set of independent variables.[8] These were selected to represent the demographic, social, economic and environmental characteristics differentiating the chiefdoms of Sierra Leone and the three general elements indicated to be relevant by the synopses of diffusion theory and of the historical evolution of the cooperative movement—Information/Exposure, Need/Relevance and Innovativeness/Entrepreneurship (Table 1*A*).

These data employ a single year of reference, 1963, the only year for which data were available. This is considered acceptable because the administrative boundaries have not changed over the period of study and there is at least some evidence that the relative levels of chiefdom characteristics also have remained stable (Clarke, 1966).

The set of Information/Exposure variables embodies the assumption, common in diffusion theory, that interaction and information flows tend to be more extensive in areas with larger populations and a higher density of population and settlements. Another common assumption is that information or exposure is inversely related to the distance from a diffusion node. Furthermore, communication and information or exposure are likely to be higher between people born in the same chiefdom than with people from other districts.

The set of Need/Relevance variables reflects the supposition that in a predominantly agrarian nation the dependency ratio and percentage of people employed in agriculture directly reflect the need for and relevance of an agricultural innovation. The variable pertaining to the average elevation of the land surface reflects the fact that ecological and climatic conditions favoring cash-crop agriculture, the focus of the cooperatives, are more prevalent at lower elevations. Finally, need should vary inversely

[8] Most of the independent variables were taken from the 1963 Census of Sierra Leone (Sierra Leone, 1965).

Figure 3: The Diffusion of the Cooperative Movement in Sierra Leone at Selected Years

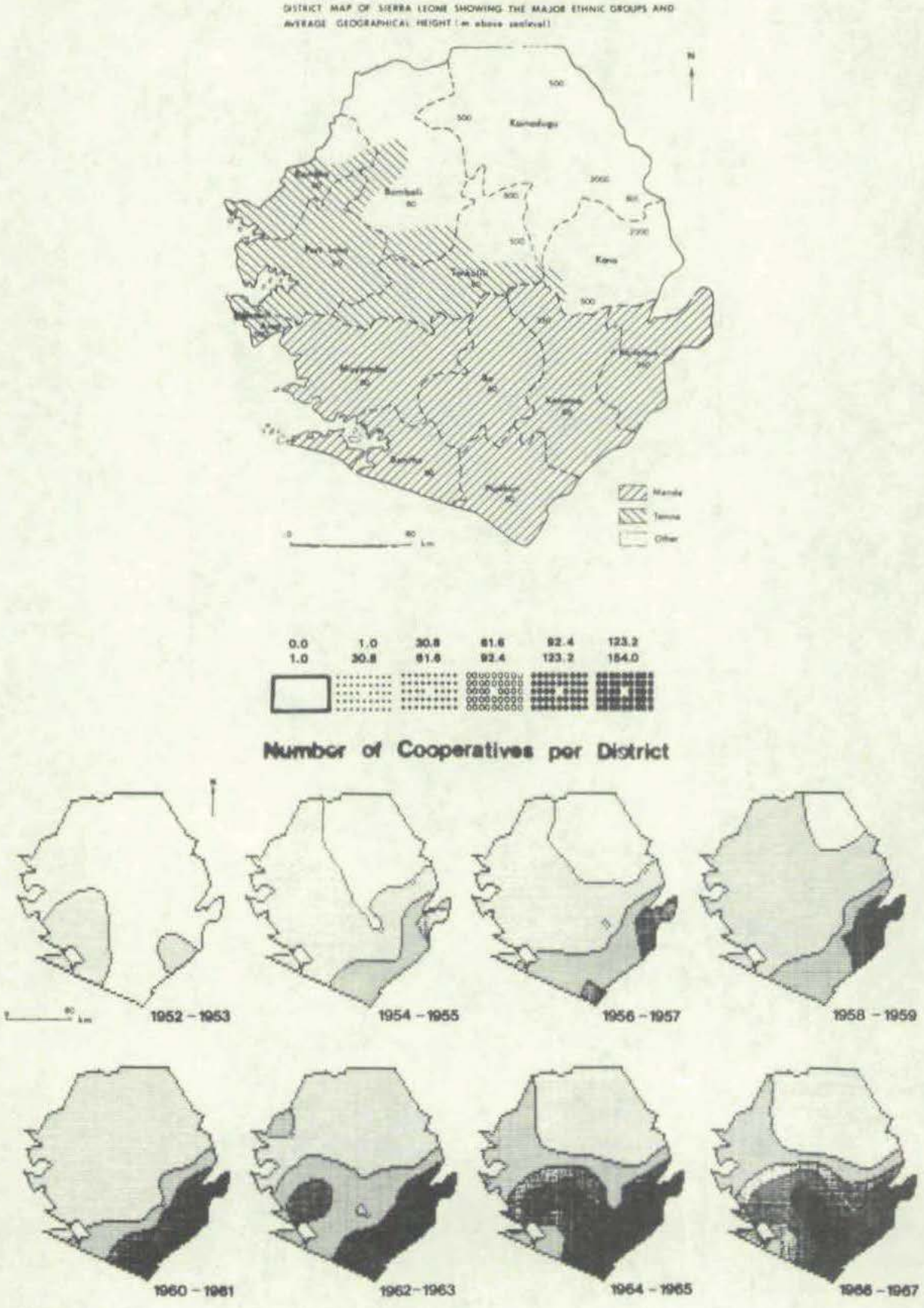


TABLE 1

Results of Statistical Analyses

Variables	A. Independent Variables and the Dimensions They Represent: Information/ Exposure	Need/ Relevance	Innovativeness/ Entrepreneurship	B. Discriminant Analysis Distinguishing Chiefdoms With and Without Cooperatives[a]: Simple *F*-Statistics	*F*-Statistics for Variables in the Discriminant Function	Standardized Discriminant Function Coefficient	C. Mean Values of Characteristics of Adopter and Nonadopter Chiefdoms: Adopters ($N = 93$)	Nonadopters ($N = 54$)	Total ($N = 147$)	D. Regression Analysis of Chiefdom Characteristics Against Years Since the First Cooperative Was Established in Each Chiefdom[b]: Zero-Order Correlations	Standardized Regression Coefficients
1. Population density per square mile	X			.1432			98.09	88.77	93.40	−.1013	
2. Number of settlements per square mile	X			2.5886			.92	.68	.82	−.0230	
3. Average population per settlement	X			.3512			428.66	395.69	416.55	−.0662	
4. Distance to diffusion node 1 (Luawa in Kailahun)	X			.4888			5.02	4.69	4.90	.0262	
5. Distance to diffusion node 2 (Soro Gbema in Pujehun)	X			.4768			4.81	4.46	4.68	−.1310	
6. Distance to nearest diffusion node	X			1.2319			3.94	4.44	4.12	−.3677	−.3932*
7. % of population born in this chiefdom	X			2.5978			74.58	78.60	76.06	.0359	
8. % of population born in another district	X			.0714			13.72	13.17	13.52	−.0780	
9. Dependency ratio[c]		X		6.4526*			.70	.77	.72	−.0223	
10. % of population in agriculture		X		.3349			83.74	85.16	84.26	.0047	
11. % of population in transport and commerce		X		.0522			.97	.90	.94	−.0651	
12. % urban population		X		.0036			14.22	14.03	14.15	−.0296	
13. Average geographical elevation (feet above sea level)		X		35.7746*	35.7746*	−.831	496.93	1065.46	705.78	−.0029	
14. % of population aged 5–29 in school			X	8.5087*			9.77	6.82	8.69	.0568	
15. Primary schools per capita			X	6.1574*			.0005	.0003	.0005	.2009	.2423*
16. Secondary schools per capita			X	.3025			.0001	.0000	.0000	.1381	
17. % of population literate in English			X	4.1059*			10.31	7.72	9.35	−.0288	
18. Number of Mende people			X	12.5452*	8.4245*	.374	5722.42	2247.11	4445.78	.0607	
19. Number of Temne people			X	.4985			5216.35	4008.31	4772.90	−.1302	

[a] The groups were coded as 1 = adopter chiefdoms, 0 = nonadopter chiefdoms. The program employed was the SPSS forward stepwise discriminant analysis routine (Nie et al., 1975).
[b] The dependent variable was the year since the first cooperative was established in each chiefdom. The program employed was OSU/ECON, which performs a backward eliminating regression analysis (Cunnyngham, 1959). $N = 147$; multiple $r = .440$; $r2 = .193$.
[c] The dependency ratio is calibrated by (% pop. < 15 + % pop. > 65) % pop. > 15 < 64.
*$P < .05$.

with the percentage of people living in towns and involved in urban commercial activities.

The Innovativeness/Entrepreneurship variables hypothesize that this quality is directly related to access to schooling and the amount of education. Literacy in English is both an indicator of the amount of education and of assimilation into the more modern sector of society. Thus, this variable ought to vary directly with innovativeness and entrepreneurship, as should the number of Mende people. Where there are large numbers of Temne people, the level of cooperative establishment is expected to be less, in part because cooperatives were associated with the Mende, a rival ethnic group.

Distinguishing between Adopter and Nonadopter Chiefdoms. Examination of the univariate F statistics of the discriminant analysis (Table 1*B*) indicates that significant variables for distinguishing between chiefdoms with cooperatives and those without are the dependency ratio ($v9$), elevation above sea level ($v13$), the percentage of people aged 5–29 in school ($v14$), the number of primary schools per capita ($v15$), the percentage of people literate in English ($v17$) and the number of Mende people ($v18$). The final discriminant function, reflecting both the intercorrelations among variables and their relationship to adoption or nonadoption, employs only elevation above sea level ($v13$) and the number of Mende people ($v18$). Examination of the standardized discriminant function coefficients (Table 1*B*) indicates that chiefdoms in a higher terrain and with a relatively smaller number of Mende tend not to adopt, and that the topographical variable is more than twice as strong as the ethnic variable in accounting for the spatial variation in adoption as compared to nonadoption.

The effectiveness of the discriminant function can be evaluated by comparing the classification of chiefdoms from the discriminant function with their actual classification. Overall, 74.15% of the chiefdoms were correctly classified. This level, which is analogous to the level of explained variance, is quite good. Further, the misclassifications that did occur were largely among those chiefdoms that did not actually have cooperatives; 38.9% of these were misclassified whereas only 18.3% of chiefdoms with cooperatives were misclassified by the discriminat function. The high misclassification of chiefdoms without cooperatives is because many of these have high Mende population and low relief but also are areas where commercial activity was largely handled by large European commercial enterprises, rather than small Lebanese and Syrian enterprises, and where extensive cash cropping is a relatively recent introduction.

To gain a more complete picture, it is useful to consider the variables indicated as significant by the univariate F statistics (Table 1*B*) along with the means of each for adopter and nonadopter chiefdoms (Table 1*C*). This indicates that cooperatives tend to be founded in areas with a lower dependency ratio ($v9$), lower elevation above sea level ($v13$), a

higher percentage of the population aged 5–29 in school ($v14$), more primary schools per capita ($v15$), a higher percentage of the population literate in English ($v17$) and a greater number of Mende people ($v18$).

Looking at these findings in a broader context indicates that the distinction between adopter and nonadopter chiefdoms is largely on the basis of the need for the cooperative or its relevance in each chiefdom and the extent to which the chiefdom's population is innovative or entrepreneurial. This observation is consistent with the historical account, which indicated that the government orchestrated the diffusion of cooperatives in Sierra Leone with exactly these criteria in mind.

Time of Cooperative Establishment Analysis. In order to gain further insight into the diffusion of the cooperative movement in Sierra Leone, attention is now turned to the subset of chiefdoms with cooperatives. The basis of the observations in this section is a regression analysis employing the year since the first cooperative was established in each chiefdom and the 19 independent variables listed in Table 1.

Examination of the zero-order correlation coefficients from this analysis (Table 1*D*) indicates that the initial establishment of cooperatives occurred earlier in chiefdoms that were lower in population density per square mile ($v1$), closer to one of the diffusion nodes ($v6$), with more schools per capita ($v15$, $v16$), and with a smaller number of Temne people ($v19$). The multiple regression equation, eliminating those variables which in combination do not significantly increase the r^2 of the model, is comprised of distance to the nearest diffusion node ($v6$) and primary schools per capita ($v15$).

In a broad context, these findings indicate that information or exposure to the innovation and the innovativeness or entrepreneurship of a chiefdom's population were important factors related to the time order of establishment, whereas the need or relevance of the cooperative was not. This is consistent with the government's policy, elaborated in the historical account above, which gave greater support to chiefdoms near those with already established cooperatives and chiefdoms with more entrepreneurial populations.

This role of the central propagator, the Sierra Leone government, in orchestrating the diffusion and determining its broad outlines is consistent with the theory outlined at the beginning of this paper. This theory also suggests that within these outlines the time order of diffusion should exhibit a strong random element (Brown et al., 1974). The r of .44 ($r^2 = .19$) indicates that this is indeed the case with the diffusion of cooperatives in Sierra Leone.

CONCLUDING OBSERVATIONS

Only recently have there been attempts to articulate the interface between innovation diffusion and economic development and social change

in Third World settings. This article is a contribution to that effort. It first presents a conceptual framework linking diffusion processes and development and then exemplifies a portion of that framework by examining the diffusion of agricultural cooperatives in Sierra Leone from 1948 through 1967.

The example is one of diffusion agency establishment in a decentralized decision-making setting with central propagator support. The diffusion agency in this context is the cooperative itself, and the central propagator is the Sierra Leone government. Four aspects of this diffusion were examined: (1) its historical evolution, (2) the temporal and spatial patterns of diffusion, (3) the variables related to a chiefdom having or not having at least one argricultural cooperative by 1967 and (4) for those chiefdoms with cooperatives, the variables related to the time at which the initial cooperative was established in each. The independent variables in the latter two aspects were determined on the basis of our conceptual framework and the historical account of the evolution of the cooperative movement in Sierra Leone. In general, these variables represent three dimensions: information linkages and exposure to the innovation, the need for or relevance of agricultural cooperatives in a given locale, and the entrepreneurship or innovativeness of the population in a given locale.

In distinguishing between chiefdoms with cooperatives and those without, it was found that relevant factors were the need for or relevance of the cooperative and the entrepreneurship or innovativeness of the population. These, then, appear to constitute threshold conditions for diffusion agency establishment. Among those chiefdoms that met these conditions and had cooperatives, the time order of establishment was related to the level of information and exposure to the cooperative idea and, again, the entrepreneurship or innovativeness of the population. These findings are in conformance with the conjectures of contemporary theory pertaining to diffusion agency establishment under a decentralized decision-making structure.

The problem becomes more interesting, however, when the role of the government is contemplated. It provided training programs for cooperative personnel, promotional stimuli and other incentives for establishing cooperatives. The effect of these programs is evident in the temporal trend of the diffusion wherein upward spurts correspond with increased effort by the government.

However, the incentives were not offered uniformly to all parts of the country. Because of capital scarcity and a shortage of qualified personnel, a spatial strategy was devised favoring areas located in proximity to already established cooperatives and areas where the utility of and receptivity towards the cooperative would be greatest. As implemented, this policy favored chiefdoms in south and southeastern Sierra Leone where climate, terrain and other ecological conditions were seen as most conducive to cash-crop agriculture and where the major ethnic group was the Mende, who were regarded as more receptive to modernization (in-

novative) than other ethnic groups. The effects of this strategy are evident in the spatial pattern of diffusion, which exhibits marked neighborhood effects, higher levels of cooperative establishment in Mende country, and almost no cooperatives in the north of Sierra Leone.

Considering the government's role together with the findings of the statistical analyses raises an important chicken-and-egg question. Entrepreneurship or innovativeness is an essential quality according to most theories of development and innovation adoption, and indeed, this factor was shown to be significant by our statistical analyses. But, is more education and the number of Mende people really representative of innovativeness, or do these kinds of people adopt earlier because the government used these characteristics as criteria for meting out incentives?[9] Similar questions have been raised in other contexts. With regard to the concept of innovativeness in adoption, for example, Brown et al. (1976: 115) note that

> differences in adoption time may be the result of the marketing strategy of public or private propagators of the innovation rather than the result of innovativeness characteristics of potential adopters.

Likewise, with regard to the two-step flow-of-communications model that is a major promotional strategy of many Third World development programs, Brown et al. (1977:23) note:

> . . . [This] communications strategy implicitly segments its market in favor of the more progressive farmer, thereby reinforcing income differentials. This practice has traditionally been justified on the basis of the innovativeness of such persons, but this paper as well as other recent research has questioned this assumption, pointing out that diffusion agency strategies and differential access to institutional resources are often more important determinants of who adopts when.

Considering further that the early cooperatives in Sierra Leone were in the north and in remote, scattered areas, instead of in the south, raises the possibility that the government played a distinct discriminating role, albeit inadvertently, by knighting some locales and some types of people as innovative or of high entrepreneurship.

Further, although a spatial allocation system is necessary, given scarce resources, it remains important to critically examine the prevailing allocation systems employed in diffusion programs of developing countries, like that controlling the establishment of cooperatives in Sierra Leone. This question arises in part because of observations such as those above. Also, however, it seems apparent that we must clarify what we mean by concepts such as innovativeness or entrepreneurship—theoretically, empirically and in terms of measurement. That would greatly enhance our

[9] In the context of this question it is also noteworthy to recall the observations in the historical account which pertain to the ambiguity of the Mende's role in the diffusion of agricultural cooperatives.

capability of providing guidelines for program design and evaluation to achieve some planning or policy objectives.

Finally, some comments on the questions not addressed in this article are in order. Studies linking innovation diffusion and development are rare, and the present effort is only a start toward expanding our knowledge in this area. One important question, using the cooperative as an example, is the adoption of the cooperative by individual users, the innovation establishment strategies related thereto, and the resulting level and characteristics of nondiffusion.[10] On the basis of other studies, it is anticipated that the differential treatment of chiefdoms noted in the present study also would be found among individuals. Accordingly, it is important to further examine the actions of diffusion agencies and governments in Third World settings in order to identify the ways in which potential adopters are differentially treated and the resulting effects.

Another important question is the impact of the cooperative. In promoting innovations in Third World settings, there is an implicit assumption that innovations are in fact good and lead to development. This assumption has been questioned where particular innovations have resulted in markedly increased economic disparities among social classes, as in the Green Revolution in India (Yapa, 1977) and in a variety of agricultural innovations in Colombia (Havens and Flinn, 1970, 1975) and elsewhere (DeSouza and Porter, 1974). Also needed, however, are systematic examinations of the impacts of innovations in situations in which the negative effects or the nondiffusion problem are not so flagrant.

Such an endeavor would quickly lead to yet another question, that of the differential impacts of various innovations and the innovations (and their characteristics) best for achieving given development objectives. An interesting illustrative example is textile mills in Brazil. The majority of the benefits from synthetic mills accrue to established industries, large metropolitan areas and rural areas with plantation or agribusiness agriculture. The most marked effects of cotton mills, on the other hand, accrue to small business, individual entrepreneurs, and the rural and small town economy in proximity to the towns in which the mills are located. The decision of whether to foster synthetic or cotton mills thus requires that development objectives be established, but also that the effects of each type of textile mill be understood and anticipated.

[10] The nondiffusion question has been examined by Yapa (1976, 1977) in terms of the differential benefits accruing to adopters as compared to nonadopters. An additional dimension is the differential benefits accruing to early adopters as compared to later adopters. This has been discussed in terms of an adoption rent (Brown, 1975:208, 1979: ch. 8) whereby the early adopter experiences excess profits which decrease over time, for that adopter and for later adopters, as the market adjusts to supply conditions. This has two long-run effects. First, to the degree that adoption rents systematically accrue to some members of society and not others, economic disparities among individuals, social groups or areas are maintained and often increased. A second long-run effect is that laggard adopters fail to achieve an adoption rent and, depending upon the price elasticity of demand, may be forced out of business. This question also has been examined by Mitchelson et al. (1977).

These are obviously important areas of research, especially because the actual impact of an innovation is often counterintuitive. Clearly, then, our research priorities must be broadened and policy relevant findings will follow.

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