A FACTOR ANALYTIC INVESTIGATION OF MODERNIZATION AMONG KENYA VILLAGERS

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Joseph R. Ascroft

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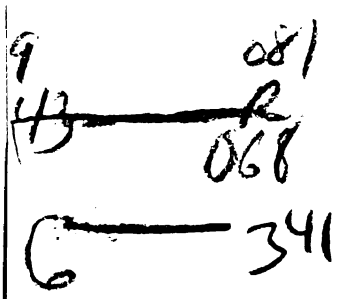

A FACTOR ANALYTIC INVESTIGATION OF MODERNIZATION AMONG KENYA VILLAGERS

By

Joseph R. Ascroft

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ABSTRACT

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OF MODERNIZATION AMONG
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There is currently much activity within less developed nations to seek ways and means of urging and accelerating technological change in the rural sectors of their economies. Their common goal is manifestly modernization, perceived by them as the minimization of the material differences between theirs and the lifeways of the relatively developed nations of this world. It is the thesis of the present study that the introduction of new technologies per se do not of themselves seem to generate sufficient power to produce the desired agricultural revolution among the inhabitants of less developed nations. Account needs to be taken of the many interacting, interdependent variables, involving not only material, but also social, cultural and intellectual factors whose peculiarities of configuration in psychological space may dispose an individual to be more or less favorable to modernizing influences.

The purpose of the present investigation is the exploration of the interdependencies among such variables with a view to determining meaningful dimensions which can be used in explaining and predicting the process of transition from traditional subsistence to modern commercial systems of agricultural production in predominantly agrarian peasant communities.

To this end, the interrelations among 43 variables indicating various aspects of peasant community life were examined. In order parsimoniously to summarize the interrelations among so many variables, factor analyses were utilized as a means of determining the number and nature of underlying factors among the 43 variables. The use of factor analysis was exploratory, rather than confirmatory, and therefore, was performed without specific hypotheses as to the nature and number of meaningful dimensions underlying the process of modernization. Separate factor analyses were performed on the 43 by 43 intercorrelation matrices of each of three Kenya village locations and of the three village locations combined into one, yielding a total of four separate factor analyses.

Personal interviews with 624 heads-of-household were conducted in three village locations in the Republic of Kenya. Area sampling techniques were used to locate final informants who responded to a pre-tested interview schedule administered by specially selected County Council Community Development assistants under the supervision of trained personnel.

The principle axis solution with Varimax rotations, using the Kiel-Wrigley criterion for terminating factor analysis, extracted between seven and nine factors from the factor intercorrelation matrices. These were reduced to five in each village and in the combined sample by application of a second arbitrary criterion derived from a comparison of factor

similarities across the four solutions. No one factor in each of the four solutions predominated appreciably over the other factors in terms of proportion of total variance explained. Thus, it was concluded that modernization was a multidimensional phenomenon, having at least five meaningful dimensions:

1. Ability to understand communication
2. Family Structure
3. Receptiveness to change
4. Aspirational orientation
5. Agricultural productivity

The nature of the ability to understand communication and the family structure dimensions evinced remarkable similarity across villages. The receptiveness to change and aspirational orientation dimensions attained moderate similarity across villages, while the agricultural productivity dimension indicated the least similarity across the three villages.

The five dimensions now require substantiation through future confirmatory research and analysis, drawing from a thorough sampling of the spectrum of aspects which pertain to the "way of life" of peasant farmers. To this end, it may be hypothesized that there are at least five dimensions of modernization, and the nature of these dimensions can be specified.

Since the present investigation has essentially done no more than reduce a large number of variables to a manageable few underlying factors, it is not possible, on the basis of these findings alone, to infer, even conjecturally, the probable time order of the acquisition of the attributes of each of the five dimensions. Whether or not it is possible to infer time order, therefore, is a matter for further investigation wherein it is suggested that a second approach to factor analysis be used in conjunction with the approach used in the present investigation. The second approach is a P analysis which identifies "types" or clusters of people sharing a common syndrome. By this means, it can be investigated whether there is any order in which each of the five dimensions are "adopted" as we progress from people "types" who are relatively traditional in their orientation to life to people "types" who are relatively modern in such an orientation.

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CHAPTER I

INTRODUCTION

Background to the Study

Most Africans today live, as they did in earlier times, by subsistence farming. However, this is an era of vastly improved and expanded communications, the age of the United Nations and similar agencies of international social change, and the plight of the African is no longer unheeded. There is general awareness that, to achieve a better material life, farm products that are surplus to those necessary to feed the farmer and his family, must be produced. To this end, governments of developing African nations whose agricultural production is based largely on traditional patterns of subsistence farming are constantly seeking ways and means of urging and accelerating technological change in the rural sectors of their economies. Their common goal is manifestly modernization, perceived by them as the minimization of the material differences between theirs and the lifeways of the relatively more developed nations of this world.

There is great impatience among African nations to achieve this goal speedily. Thus, they solicit aid, they pass decrees, yet all too frequently their harvest is frustration. In spite of, and, in many instances, in seeming defiance of well-intentioned governmental efforts, most Africans continue to live by subsistence farming. The acquisition of a new tool or a new seed variety does not of itself seem to generate sufficient

power to produce the desired agricultural revolution in Africa. Thus, by way of example, we are told by Hapgood (1965, p.60) that the climate for the "rapid development of agriculture", left by the French in Dahomey, was dissipated: "The plows and tools were never adopted: Dahomeyans farm today as they did before the French came".

There is, therefore, also a great naivety among African nations in their perception of the disposition of their constituents to sacrifice the ancient customs of their fathers for a promised but often evanescent higher standard of living.

Effective communication is essential to planned development. Rogers (1966) stated that:

> A central principle of effective communication is that one must know his audience. Programs of directed social change designed to reach peasants are likely to fail unless based upon understanding of the values, attitudes and motivations of their audience.

A few developing nations in Africa today are paying heed to this dictum. Governments in multi-tribal situations are realizing the importance of learning to "talk" to their diverse people, to empathize with them, to overcome the subtle barriers to communications produced by differential attitudes, values, and orientations. Such is the case with the government of the Republic of Kenya which recognises the need for scientific behavioral research as a means of enhancing its effectiveness in analysing and assessing those factors which stimulate or inhibit the passage of directed social change. To this end, it

commissioned a research investigation* of the factors which affect agricultural development, data from which have yielded the present thesis.

While the present thesis addresses itself primarily to the factors which affect agricultural development in Kenya, it is, at the same time, hopeful that the information thus gained will prove useful to other developing countries in the world.

Objectives of the Study

The present thesis is concerned with the further exploration of the Kenya data with a view to determining meaningful dimensions which can be used in explaining and predicting the process of transition from traditional subsistence to modern commercial systems of farming in predominantly agrarian peasant communities. This transitional process is labeled modernization in the present paper. The interrelations among 43 variables treating of various aspects of peasant community life will be examined. These variables have been selected on the basis of

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*The impetus for the three-village research project emanated from the Kenya Ministry of Labour and Social Services, whose original intention was to gather information bearing upon its community development programs. The notion burgeoned to encompass the activities and areas of interest of many other ministries in the Kenya government and generated a before/after experimental design with controls. Professional advice was gained from the United States Agency for International Development and a private research organization, Marco Surveys Ltd., of Nairobi, Kenya, was commissioned to undertake the project. The pretest was completed in 1965 and the gross analyses presenting the percentaged frequencies and some cross-tabulations of the findings have already been submitted to the Kenya government in a private report (Marco Surveys Ltd. 1965).

availability of data to provide purposive representation of such aspects of the peasants' lifeways as his communication behavior, his family structure, his agricultural productivity, his health, economic and educational activity, his demographic configuration, and certain socio-psychological orientations.

However, working with so many variables is unwieldy. Thus, a method of parsimoniously summarizing them will be utilized. The main statistical objective of the present study, therefore, will be the substitution of a factor matrix for the 43 by 43 intercorrelation matrix by factor analysis. Factor analysis is defined as "a method for determining the number and nature of the underlying variables (called factors) among large numbers of measures" (Kerlinger, 1965, p.650). A factor is defined as an hypothesized latent variable which is assumed to underly several measures and which therefore summarizes them.

The approach to factor analysis that will be used is exploratory rather than confirmatory, and hence will be performed without hypothesis as to the nature and number of dimensions explaining the process of modernization. R analysis is a response or "trait" approach dedicated to providing indices of the homogeneity with which variables cluster around an underlying factor or set of factors. By this means, it is intended to determine the extent to which one factor structure can be uncovered to describe the process of modernization i.e. to determine whether or not modernization is a unidimensional phenomenon.

So far as can be ascertained from a search of the literature, previous factor analytic studies having objectives allied to those of the present study were either based on analyses of aggregate data from secondary sources of information (Farace, 1965), or defined only a narrow subset of the modernization process as their area of interest (Deutschmann and Falls Borda, 1963). In contrast to previous investigations, the present study defines its unit of analysis and primary source of data as the individual in a peasant community and aspires to a broader definition of the process of modernization.

Justification for the Study

Development economists and planners are in constant quest of an objective, scientific vantage point whence they can survey the complex of variables bearing upon the processes of national development. All too often, for want of systematic information, they cannot see the wood for the trees. In recognition of this condition, the Conference on Productivity and Innovation in Agriculture in the Under-developed Countries (1965, p.56) included in its report the following statement, which will be taken as cardinal to the justification of the present thesis.

> The transformation of a traditional agriculture involves important and fundamental changes in the attitudes, values and orientation of farmers and of those who work with them .... Behavioral science research can aid in promoting the adoption of more productive practices by analyzing the structure, the values and the operations of agricultural administrative

units and of the peasant society and by investigating precise ways in which social institutions, individual attitudes and personal values hold back or stimulate the innovative process.

A growing body of literature has documented the need for fundamental socio-cultural-psychological re-orientations to accompany the development processes in emergent countries. Following are a set of basic assumptions which appear to be generally held in common by students of international development and which themselves provide additional justification of a specific nature for the present thesis.

1. That the historical organization of relatively self-contained socio-economic units for human survival based upon clan and tribal affiliations in predominantly agrarian situations is no longer compatible with the aspirations of the developing nations striving to modernize their lifeways.
2. That subsistence farming, heretofore adequate for human survival, must progress toward surplus farming to meet the rising needs and expectations of rural people.
3. That the rural economies of most developing countries are in some stage of transition from traditional subsistence to modern commercial systems of agricultural production.
4. That this transition affects and is itself profoundly affected by the attitudes, values and orientations of peoples within traditional social systems.
5. That opposing forces are evident in the process of

transition: (a) a reluctance to sever the long-established bonds of attachment with the customs of tradition, and (b) a great pressure upon individuals to enter into and be fundamentally modified by new competitive life forces.

6. That the resolution of this dilemma engenders powerful social, cultural and psychological conflicts which may either result in more rapid assimilation of change or lead to firmer entrenchment of traditionalism.

The present study is regarded as an initial step toward determining the degree to which these opposing forces are in evidence among the inhabitants of three Kenya village locations. Although beyond the scope of the present thesis, it is, nevertheless, recognised that the eventual goal of research investigations such as the present study, should be the determination of what kinds of modernizing programs, presented in what ways, are adopted or not adopted by what kinds of people.

CHAPTER II

THEORETICAL FRAMEWORK AND RELATED RESEARCH

Defining Modernization

The Age of Exploration, the Renaissance, the Reformation and Counter-Reformation, the Industrial Revolution, were, as Lerner (1958, p.43) indicated, all stages in an historical sequence of a dynamic process of change whereby "all men of the West had acquired a new style of life". A similar process is underway in Africa, as it is in other under-developed parts of the world. People are in many ways attaining new styles of life: some are becoming literate, others are becoming urbanized, and still others are commercializing their farming operations.

The process of reshaping the world in a modern image required the course of several centuries to reach its current state of progression, the Space Age. In Africa today, the process is being urgently and consciously accelerated to run out its entire course in a matter of one or two decades. African leaders tend to recognise, among the interactive multi-facets of this complex process, chiefly the need for sweeping and immediate technological transformations, without at the same time recognising the concommittant changes required in societal norms. To the extent that they exhibit this tendency, to this extent will the decades extend themselves into centuries. For indeed, while modernization may conceivably be considered unidimensional, it is, nevertheless, also

a multivariate interactive system containing both economic and non-economic behavioral components, each of which exhibits interdependence, in that systematic variation in one component is inextricably linked with systematic variation in other components.

The number and nature of the components forming this multivariate complex are theoretically boundless. Still, it is the purpose of science to reduce the unwieldy many to a manageable few. Rogers (1965) synthesized what is presently known about the motivations, values, attitudes, and orientations of social systems with essentially traditional norms, thereby achieving a description of the characteristics of a modern society by antithetically looking at those of a traditional society. He described the subculture of peasantry in terms of the central distinguishing tendencies of its elements: namely, that peasant societies tend to exhibit:

1. A mentality of mutual distrust, suspiciousness, and evasiveness in interpersonal relations.
2. A lack of innovativeness in their reaction to new ideas.
3. A fatalistic, passive view of the world.
4. Low aspirational levels of desired future states of being.
5. A lack of the ability to defer immediate gratification in anticipation of future rewards.
6. A limited time perspective accentuated by an orientation to the past rather than to the future.

7. A strong sense of familism often involving the authoritarianism of a patriarch.

8. A dependency upon, compounded with a hostility toward, governmental authority.

9. A localiteness which secludes them from cosmopolite influences.

10. Low empathetic ability, especially with individuals outside of the social system, which further immunizes peasants from modernizing influences.

data do not support this contention.

While this list of elements* is by no means exhaustive or self-evident, it does, nevertheless, alert us to the complex nature of the interrelationships among variables in the modernizing process. It also alerts us to the fact that modernization does not have to do solely with the acquisition of higher standards of living. Old, inefficient tools and unproductive farming practices must certainly be discarded, but so too must old, fettering notions and beliefs give way to the new. Indeed, a change in modes of farming affects a change in deep-seated beliefs and vice versa: such changes are interdependent upon each other.

There is need also to give some consideration to the contextual use of the term "modernization" in the present thesis. Lerner (1958, p.44) noted that modernization is a term "imposed by recent history". It superseded such notions as

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*The present study contains measures which allude only to four of these elements, namely: innovativeness, aspirational levels, familism and cosmopoliteness.

Europeanization, Americanization and Westernization, all terms which are essentially synonymous with modernization, but which exude connotations distasteful to the sensitivities of newly-emerged nations. Modernization possesses the eclecticism of suggesting a neutrality of association which at once repudiates any overt links with specific sources of influence and also envelops all sources of influence to change.

Students of development in emerging countries tend to use the terms "modernization" and "national development" interchangeably. It would seem that whichever term is favored depends to some extent upon the unit of analysis. Farace (1965) described national development in terms of the differing "way of life" between nations at differing levels of development. Lerner (1958, p.43) describes modernization as the process whereby individuals acquired "a new style of life". Both terms convey essentially the same meaning; they are conceptually equivalent. Similarly, the present thesis draws no distinctions between modernization and national development. The process of national development is essentially the process of national modernization.

Thus, for the purpose of the present thesis, modernization is defined as the process of acquiring new styles of life by individuals within social systems and, consequently, by social systems themselves. This definition is grounded in the Lerner (1963, p.329) proposition that:

> ... Modernity is an interactive behavioral system. It is a style of life whose components are interactive in the sense that the efficient functioning of one of them requires the efficient functioning of all others. The components are behavioral in the sense that they operate only through the activity of individual human beings. They form a system in the sense that significant variation in in the activity of one component will be associated with significant variation in the activity of all other components.

Whether or not modernity is unidimensional (albeit a multivariate interactive system), or multidimensional (i.e. varying in more than one way), is a matter for investigation in the present paper.

Finally, modernity is not an ideal state of being. As a process, its limits are infinite. It is, therefore, a conceptually convenient term which enables us to make relative distinctions between one state of being and another in terms of the degree of the attribute modernity possessed by each. Thus, one country is considered to be more modern only in relation to another country or set of countries. Similarly, one individual is modern only to the extent that he possesses more of the attribute as compared with another individual or set of individuals.

Review of Related Aggregate Analysis Research

For many behavioral scientists, there exists a substantial number of secondary sources of available materials which are amenable to quantification and analysis. Such sources are

termed "secondary" inasmuch as their data were originally compiled for a use other than that to which subsequent analysts seek tp put them. Some useful and frequently used sources include country census and registration materials and the records of international agencies providing estimates of national characteristics. Studies based on such materials are often termed "aggregate" studies since the data which they seek to analyze generally reflect modal characteristics of large socio-geographical entities such as nations.

The particular importance of aggregate studies derives from their great utility in exploring the nature of relations among variables, frequently with a view to suggesting hypotheses which may subsequently be tested systematically, using a more elemental unit of analysis such as the individual.

Previous aggregate studies investigating the correlates of modernization in less developed countries have been concerned primarily with determining linkages between modernization and mass media communication. Among the earlier investigators in this field was Lerner (1958, p.61-65), who posited a stage-development process of national evolution in which a country's scattered populace first gathers into clusters in limited areas which eventually develop into urban centres. When urbanization achieves certain proportions, teaching literacy to the citizenry becomes feasible and functional. Increasing numbers of literates in the community occasions increasing participation in the mass media,

especially the print media. Such participation engenders awareness of and involvement in political matters by the populace.

Thus, by examining the correlates of mass media facilities across 54 countries, Lerner was able to explain up to 70 per cent of the variation in mass media development on the basis of urbanization, literacy and political participation variables.

An important socio-psychological concomitant of these transformations is the development and spread of empathetic ability, which Lerner (1958, p.41) defined as "The capacity to see oneself in the other fellow's situation" and which "enables newly mobile persons to operate efficiently in a changing world".

Cutright (1963) was similarly interested in linking media development with political development across countries. His findings are very closely aligned with those of Lerner. Increasing political complexity in a country is accompanied by increasing urbanization and rising educational levels of its peoples. Development of communication, therefore, maximizes in countries where the greater part of the active labor force is not engaged in agriculture.

Caplow and Finsterbusch (1964) focussed their attention upon a country-by-country examination of the economic, welfare, and demographic aspects of modernization across 66 nations and autonomous states. Using Spearman rank order correlation,

they developed a modernization index comprised of three primary indicators which were found to have a common applicability across all the nations studied. Each nation was ranked on this index, the components of which were energy consumption, telephones per thousand, and inhabitants per physician. Among findings of particular pertinence to the present thesis are the following:

1. The level of modernization achieved by a country is almost unrelated to its national resources, i.e. to its land and human potentiality.
2. Countries with relatively higher levels of modernization were characterized by increasing transition from parochial to cosmopolitan orientations, greater material welfare in terms of per capita incomes, and better health and nourishment dispositions of their inhabitants.

These previous studies relied principally on the statistical method of correlational analysis. More recently, a study by Farace (1965) utilized a somewhat different analytic approach of factor analysis in order to reduce a large number of modernization variables to some smaller number of latent underlying factors. Like Lerner and Cutright, however, his primary interest was the explanation of the role of mass media communication in national development. Farace utilized 54 variables representing such different aspects of life in each of 109 countries as political activities, health and nourishment capabilities, agricultural productivity, climate, population

characteristics, economic and cultural manifestations, and mass media. Factor analysis indicated that the 54 variables could be reasonably explained by one principal underlying dimension which Farace labeled national development. The economic indices in the matrix were found to have the highest loadings on the national development factor and were, therefore, considered to reflect its "core". The mass media indices were nearly as highly loaded on the factor, suggesting that economic development was accompanied by a development and spread of the mass media.

Farace finally (1966) attempted to classify 109 countries into national systems on the basis of clusters of countries sharing common syndromes or patterns of development across the 54 different measures of national characteristics. Six such clusters resulted, the one of principal interest to the present thesis being the national system labeled Central/South Africa, wherein is included Kenya. This national system was characterized as having, among other properties, high illiteracy, relatively low media exposure levels, and a predominantly animist religion.

A Critique of Aggregate Analysis Research

Aggregate studies are most frequently criticized for the lack of generalizability of their findings to sub-populations and individuals within their units of analysis. Furthermore,

they do not directly reflect basic attitudinal, motivational and orientational socio-psychological differences prevailing within and among their units of analysis. These criticisms notwithstanding, aggregate analyses certainly possess great utility at the macro level of analysis as instanced by studies involving firms, industries and similar enterprises. They add to our fund of knowledge both directly and by way of yielding useful exploratory estimates of relationships which are frequently amenable to study in field experiments utilizing smaller units of analysis, thereby leading to the creation of more enduring and systematic theories.

Insofar as analyses of national characteristics in development are concerned, however, important criticisms do exist which rest mainly in questionable methodological practices, especially in the methods by which the data came into existence. All too frequently, data are in the form of unsound estimates, often bordering upon conjecture. Some countries are not beyond falsifying certain data in order to bias opinion in some desired direction. Others seek to impart an aura of great credibility to data of suspicious authenticity. While it is not suggested that the data gained from primary sources are entirely devoid of similar shortcomings, aggregate studies do exhibit relatively greater proneness in this direction, especially inasmuch as subsequent analysts lack control over the manner in which the data were initially collected. It is pointed out, however, that most researchers utilizing secondary sources of available materials

are often aware of, and attempt to limit, these effects.

From the viewpoint of statistical analyses of aggregate data, some criticism of the interpretation of findings stems from the use of the Pearsonian correlation. The concern appears to be not so much with the violation of any underlying statistical assumptions as it is with the apparent tendency for Pearsonian correlation coefficients to be higher for aggregate data than for similar data from individual units of analysis. This tendency is frequently ascribed to the fact that the unit of analysis in aggregate studies is an entity, such as a country, whose characteristics result from the pooling of many smaller units of analysis within that country and, consequently, span a greater range of talent than do more elemental units. Variability, therefore, tends to be curtailed in smaller units of analysis, giving rise to lower correlation coefficients. Proponents of this contention, therefore, would advocate great caution in approaching generalizations from aggregates of persons to individuals. However, most correlations within countries are on very homogeneous populations, such as peasant farmers, whereas national aggregates encompass very heterogeneous population types which include commercial farmers as well as subsistence farmers, urban citizenry as well as rural peasants, and the enlightened as well as the illiterate. Thus, a better comparison of aggregate correlation coefficients with within-country correlation coefficients would be to have a national probability sample for a country,

such that all sub-populations within a country are taken into account. Across country and within-country correlations are rendered more comparable under the assumption that the distribution of variables within countries ought to be very similar to the distribution of the same variables across countries. Most people, like most countries, have very little of a given attribute, such as wealth, while a few persons, like a few countries, have very much of that attribute. The expectation, therefore, would be for Pearsonian correlation coefficients on aggregate data to be more comparable in numerical size to those on similar data for individuals.

Withal, it continues to be advisable to exercise more than the usual caution in generalizing from aggregates of persons to individuals, especially where the individuals are parts of a homogeneous sub-population which itself is one part of a heterogeneous group of sub-populations.

Review of Related Factor Analytic Investigation at Individual Level

So far as can be ascertained from a search of the literature, there exists only one factor analytic investigation (a) that was conducted in a peasant community setting, (b) having objectives that were somewhat aligned with those of the present study and (c) which utilized the individual farmer as the unit of analysis. This study was conducted by Deutschmann and Falls Borda (1963), whose main concern was the determination

of the factors of innovativeness, using 23 variables covering a wide range of aspects among the peasant farmers of Saucio, an Andean village in Colombia. The study included such items as age, sex, farm size, degree of farm ownership, communication channels, education, literacy levels, and a number of variables involved in the process of learning about a new farm practice and adopting it. A total of nine factors were extracted by factor analysis with Varimax rotations. The findings indicated that the 23 variables could not be reasonably explained by one principal underlying dimension. They found, however, that most variables loaded highly on one, though not the same factor and only negligibly on all other factors, thereby suggesting a high degree of factor purity.

The more important factors of innovativeness in terms of percent of common variance explained are:

1. Economic ability to innovate, with the highest loadings coming from size of farm and the respondent's willingness to go into debt in anticipation of possible future rewards.
2. Awareness of innovations, with the general tendency to know about innovations early or late providing the highest loadings.
3. Ability to Understand Communications, with years of school and literacy providing the highest loadings.
4. Orientation to Local/Distant Communication Channels, with local and cosmopolite interpersonal communications and change agent contact providing the highest loadings.

5. Egocentric Channel Orientation with on-farm information sources and organized farm demonstrations providing the highest loadings.
6. Adoption Leadership with socio-metric opinion leadership providing the highest loading.

A System View of Modernization

A system is a "boundary-maintaining set of inter-dependent particles" (Schramm, 1963, p.30). The system view of the relationship among particles is that there is no direct cause-and-effect linkage. The particles are interdependent within a system which has clearly definable boundaries.

Farace (1966) considered "some geo-physical entity, such as a nation, as the boundary of a 'system'". The particles were the variables of the system which could be singled out for study. The variables in the system could be further divided into sub-systems, which may be defined as groups of interrelated, interdependent variables pertinent on some criterion to the system under study. From this standpoint, Farace was able to examine the system either in terms of its sub-systems or by taking the broader view of delineating clusterings of national systems sharing common characteristics.

While not hypothesizing the number of dimensions which explained the process of national development, Farace found it to be conceptually convenient, in listing the developmental aspects of national systems, to group variables into such

sub-systems as mass communication, political activity, health and nourishment, agricultural productivity, climate, population characteristics, and cultural and socio-psychological manifestations.

By the same token, the present thesis considers the individual in the village as the boundary of the system and groups similarly the variables bearing upon modernization into such subsystems as communication behavior, family structure, agricultural productivity, health, economic and educational activity, demographic configuration and socio-psychological orientations. These subsystems collectively describe the "style of life" of individual peasants. They are components in an interactive behavioral system which are not linked in any single direct cause-and-effect associations. Rather, the components are interdependent. These subsystems are not viewed as hypothesized factors but as arbitrary, conceptually convenient foci about which can be gathered clusters of logically related variables.

1. Communication Behavior

Pye (1963, p.3) contended that "it was the pressure of communication which brought about the downfall of traditional societies". In the modernizing process, both personal and impersonal communication possesses the capability of (1) creating awareness of new ideas, (2) fostering benevolent attitudes to new ideas, (3) reinforcing already existing favourable attitudes to change, and (4) changing prevailing

negative attitudes to modernization. Communication channels convey to members within a social system information from outside the social system's boundaries. Communication messages keep each member informed of the state of others in the social system. Thus, programs of directed social change have a greater likelihood of success in the presence of effective communication channels and messages which are oriented toward the receivers. In the communication behavior sector, therefore, are included variables which are measures of exposure to radio, cinema, daily newspapers, magazines, and contact with change agents.

2. Family Structure

Rogers (1965) noted that a strong sense of familism, wherein individual aspirations are subordinated to those of the family unit as a whole, tends to restrict innovativeness. Generally, decisions to venture into the realm of the novel are contingent upon a joint decision of all family members, frequently under the authoritarianism of a patriarch. It is reasonable to expect, therefore, that this condition is aggravated in situations of increasing complexity of family structure. In the family structure sector are included variables which are measures of overall size of the household unit, the proportion of adults and males in the household unit, and the complexity of the household structure in terms of the number of housewives it contains.

3. Agricultural Productivity

The level of agricultural productivity of an individual farmer is an important index, not only of the farmer's ability to provide adequate nourishment for his family, but also to provide sufficient surplus products for sale on the market. Agricultural productivity is in turn determined by the size of the farmer's land, the intensity of its tillage, the degree of crop specialization, his orientation toward commercial rather than subsistence farming, the implements he uses, and the nature of the farming practices he uses. In the agricultural productivity sector, therefore, are included variables which are measures of the degree of farm fragmentation, size of farm in acres, variety of farm implements used, diversification of crops (including indices of inherited, introduced and cash crops grown), intensification of tillage, agricultural innovativeness and participation of household unit members in group activities such as farmers' field days, agricultural and veterinary demonstrations, and co-operative meetings.

4. Health Activity

A reasonable physical disposition and adequate nourishment appear to be important prerequisites for an active, energetic family. Thus, the adoption of practices which are conducive to the maintenance of good health and prevention of diseases would, in part, enhance the individual farmer's chances of increasing his agricultural productivity. In the

health activity sector, therefore, are included variables which are measures of the proportion of deaths in the family during the past year, and home innovativeness which includes methods of human and other waste disposal.

5. Economic Activity

One of the ubiquitously used yardsticks in the assessment of individual and national development is economic achievement in terms of raised per capita incomes. Raising the average per capita income constitutes the principal objective and justification in the modernization of a society. Evaluation of individual and family incomes and their sources indeed provide one of the most overt indicants of progress in the modernization process. The economic activity sector includes, therefore, variables which are measures of total household income from all sources, level of living, number of family members away from home but contributing to the household income, and the degree of farm commercialization in terms of the proportion of all crops sold during the past year.

6. Educational Activity

Lerner (1963, p.34) stated that literacy is "indeed the basic personal skill that underlies the whole modernizing sequence". The majority of literates acquire this ability in the schoolroom in the process of obtaining a formal education. Thus, the degree to which an individual is educated must, in substantial part, determine the degree to which he is literate, thereby also determining the degree to which he is equipped

to assimilate modernizing influences. Respecting illiterates, the degree to which they educate their children or aspire to higher education for their children measures, to some extent, their awakening to the need for such a "basic personal skill" as literacy in a changing world. The education activity sector includes, therefore, variables which are measures of level of education and literacy of the head-of-household, aspirations for education of sons and daughters, proportions of literates and school-goers in the family unit, and the adults and away-from-home school-goers in the family unit.

7. Demographic Characteristics

An individual's demographic configuration within a population appears to exert strong influences upon his propensity to modernize. Rogers (1962, p.174) pointed out, for instance, that the "general evidence seems to indicate that innovators are younger than laggards". It has often been observed that an individual's demographic profile, involving such characteristics as age, sex, and kinship affiliations, patterns for him his role and status in traditional social structures. The influx of modernizing influences can have severely unsettling repercussions upon these time-annealled patterns of societal organization. The acceptance of Christianity is in itself an innovation which has been fraught with all manner of consequences, some beneficient, others traumatic. Sharp (1952, p.86) chronicled the consequences of Christian largesse

upon traditionally established age, sex, and kinship roles wherein males of the younger age groups and females, previously limited to subordinate roles, acquired a "new degree of freedom which was accepted readily as an escape from the unconscious stress of the old patterns, but which left them also confused and insecure". In the demographic characteristics sector are included variables which are measures of sex, age, and religious persuasion of the head-of-household.

8. Personal Socio-Psychological Orientation

Underlying all the changes that must occur in the foregoing subsystems is the need for the individual himself to change in terms of his values, motivations, and orientation to his life situations. Lerner's thesis (1958, p.61-65) was that the development of empathetic ability, i.e. the ability to take the role of others, was necessary to enable "the newly mobile persons to operate in a changing world". McClelland's contention (1963, p.154) was that high need achievement, indicative of an individual's desire for occupational excellence, is associated with economic development. These examples provide evidence of the fundamental changes that are required in the cognitive processes of the individual, especially in respect of those processes which serve to hamper the acceptance of new ideas. Thus, a new way of life expresses, basically, the acquisition of a new set of socio-psychological norms. Included in this sector of personal

socio-psychological orientation, are variables which are measures of achievement motivation, occupational status and satisfaction, cosmopoliteness, attitudes towards tribal customs and toward monogamy, and degree of non-opinionatedness in terms of a proclivity to respond "don't Know" to selected opinion questions.

CHAPTER III

METHODOLOGY

The Sample and Study Setting

The data for the present study are based on personal interviews with 624 putative heads-of-household having effective control over family holdings at the time of the interview. Area sampling techniques with probability-proportionate-to-size were employed. They involved a 10 percent sampling rate of all homesteads discernible on maps drawn from aerial photographs in three spacially separated village locations in Kenya. A "village location" is an administrative unit, much like a county in the United States, and generally covers an area of about 100 square miles. The three locations investigated in the present study were selected purposively on the basis of their relative potential for agricultural development, and for the comparative value of studying distinct and geographically separated tribal entities in the process of transition and change. The present study covered three tribal groups, the Kipsigis, the Luo, and the Luhya, each representing three basic ethnic language divisions, the Nilo-Hamitic, the Nilotic, and the Bantu, respectively.

The selected locations are:

1. Bomet Location 7 in Kipsigis County, (N:243) situated in that part of Western Kenya on the upper escarpment which lies

between the town of Kisii and the former white settled areas, some 200 miles from the capital city, Nairobi. The Kipsigis, the main tribal group of the area, are one of a group of Nilo-Hamitic tribes which extend from Lake Rudolf in Western Kenya to the central Tanzanian plateau. Until recent times, the Kipsigis were almost exclusively pastoralists, growing only sufficient cereals for beer making and family consumption. They have always been wealthy in cattle and, consequently, their diet has been relatively high on protein, accounting, perhaps, for the vigor with which they have entered into agriculture. The climate and soil of the Kipsigis area are suited to intensive agriculture. The area generally has a higher agricultural potential than the other two areas studied in the present investigation.

2. Kabondo Location in South Nyanza County, (N:216), is situated in that part of Western Kenya which lies between the town of Kisii and Lake Victoria. It is some 200 miles from Nairobi. The Luo, the predominant tribe in the area, is one of a group of Nilotic tribes extending from the Sudan, through Uganda, to the shores of Lake Victoria. The Luo were historically pastoralists and fishermen, but cattle no longer dominate their economy. They have become largely agriculturalists with greater crop diversification than the Kipsigis. They suffer, because of their system of land inheritance, greater problems of land fragmentation than do

the other two groups studied in the present investigation.

3. Samia Location in Busia County, (N:165), is situated in the corner formed by the Kenya/Uganda border and Lake Victoria, about 300 miles from Nairobi. The Basamia are one of the tribes which make up the Luhya speaking people who are considered to be among the most northerly of the Bantu-speaking peoples in Africa. Frequent intermarriage with the Luo has drawn the two tribes together so that they now exhibit many commonalities of traits, including physical features. The Basamia are, in a sense, a divided tribe, inasmuch as they straddle the Kenya/Uganda border. The Basamia are, and always have been, predominantly agriculturalists, though the topographic and soil conditions of the area make cultivation difficult, retarding, to some extent, development in agriculture.

Interview Schedule and Pre-test

Several Kenya government ministries with interests in rural services participated in the formulation of the interview schedule which also benefitted from the advice of such cosmopolite sources as Michigan State University. The final instrument was designed by Marco Surveys Ltd., following extensive pre-testing at Kisii where all the interviewers who were to be engaged in the project were gathered together. Thus, pre-testing was accomplished at the same time that

initial interviewer training was conducted. Interviewers first interviewed each other before venturing into the field. Changes suggested in the pre-test were incorporated into the schedule and pre-tested once more, this time in areas neighbouring the locations which were selected for the study*.

Data Collection

Interviews were conducted by professional County Council Community Development Officers under the guidance and direction of a United States Agency for International Development advisor to the Kenya government and by the author of the present thesis in his capacity as Technical Manager of the contracting research organization, Marco Surveys Ltd., of Nairobi. All interviews were completed over a period extending from June through August, 1965.

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*The three village location project has been designed as a field experiment with before-and-after measures and control groups. An intervening period of three years has been planned between measurements, during which time the Kenya government and the United States Agency for International Development will be jointly responsible for actively manipulating certain economic variables through the provision of material and expert aid to farmers, with a view to hastening development within the experimental areas.

Operationalization of Variables* and Scale Construction

The present study is descriptive and correlational in nature. Hence no manipulation of variables was done prior to or during the collection of data. The conceptual and operational definitions along with some samples of items used are:

Communication Variables

1. Change agent contact is the extent to which individual farmers interact with agents of change who are defined as professional persons who attempt to influence adoption decisions in directions that they feel is desirable (Rogers, 1962, p.283). The variable was operationalized in two different ways to obtain (1) agent-initiated, and (2) client-initiated contact scores. Operationally, change agent contact is the sum of scores a farmer obtains from his responses to questions dealing with specified categories of change agents whom he has visited at least once or who have visited him at least once during the past year. The question asked was:

> "Which of the following people: Chief or sub-chief, agricultural, veterinary, and community development officer, visited this farm since June last year?"

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*At the time the variables for the Kenya three village project were selected, the production of the present thesis was not expressly anticipated. The author was constrained, therefore, to select only those variables for which adequate measures were available in the original study for inclusion in the present factor analytic investigation.

"Which of them have you or any member of this household visited for information at any time since last June?"

0. Contacted no change agents
1. Contacted one change agent
2. Contacted two change agents
3. Contacted three change agents
4. Contacted four change agents.

2. Exposure to mass media is the extent to which individual farmers attend such mass media as radio, cinema, daily newspapers, and magazines. Operationally, the respondent's degree of exposure to each of the mass media (individually) is indicated in terms of the recency of his last exposure to each medium, more recent exposure being equated with regular attendance and temporally distant exposure with infrequent attendance. The same question format and response categories were used for each of the mass media. For example, the radio exposure question was:

"When was the last time you listened to radio?"

0. Never listens
1. More than a month ago
2. More than a week ago but within the past month
3. More than a day ago but within the past week
4. Yesterday or today

Family Structure Variables

1. Size of household unit was taken as the actual number of members of the household who were living on the farm on the day of the interview.

2. Proportion of adults in household unit was taken as the ratio of adult (16 years and over) household members to all household members present on the farm on the day of the interview.

3. Proportion of males in household unit was taken as the ratio of male household members to all family members present on the farm on the day of the interview.

4. Complexity of family structure is the degree to which a household unit is other than nuclear. Operationally, complexity was measured by counting the number of family members designated as housewives in the household unit at the time of the interview. These included polygamous wives and concubines of the head-of-household, his sisters-in-law, daughters-in-law, and married daughters living as part of the household unit on the day of the interview.

Economic Variables

1. Total household income from all sources was taken as the income earned from such sources as farm operations, employment of all household members, contributions from members working away from home, and all other emoluments which accrue

directly to the household unit for its use and maintenance.

2. Commercialization of farm products is the degree to which farm products, which are surplus to those produced for subsistence, are cultivated. Operationally, commercialization of farm products is the proportion of the quantity of crops sold in the past year over the total crop output during the same period.

3. Number of family members away working was taken as the number of members of the family who were not living on the farm on the day of the interview but were away working and contributing materially to maintenance of the household unit.

4. Level of living is an indicant of social status and is measured by the possession of such items as a radio, cupboards, chairs, tables, a bicycle, a clock, a wrist watch, and a kerosene lamp.

Demographic Variables

1. Age of head of household was taken as the actual reported age on the day of the interview.

2. Religion of head of household was scored on a Christian-Sectarian-animist continuum. Sectarians are members of psuedo-Christian religious cults who generally seek to deify the Virgin Mary. They borrow freely from Christian doctrine and traditional custom to form the basis of their belief. Sectarians are not recognised as Christians by the established churches. The question asked was:

"What is your religion?"

0. Animist

1. Sectarian

2. Christian

Agricultural Productivity Variables

1. Farm fragmentation is the degree to which an individual's spacially separated land holdings are not consolidated into one piece. Operationally, it is the number of spacially separate pieces of land to which the farmer lays claim as belonging to him.

2. Size of farm in acres was taken as the total number of acres of all land holdings owned by an individual farmer within his village location.

3. Farm implements index was taken as the number of different types of farm implements possessed: such as a hoe, shovel, wheelbarrow, metal plough, harrow, etc.

4. Inherited Crop Index is scored as the number of different food crop types grown and which were common to the area prior to the advent of the white settlers. Inherited food crops include maize, millet, beans, sweet potatoes, and ground nuts.

5. Introduced Crop Index is scored as the number of different food crop types grown and which were introduced subsequent to the advent of the white settlers. Introduced food crops include English potatoes and various garden vegetables.

6. Cash Crop Index is scored as the number of different crop

types grown expressly for the purpose of sale and not for home consumption. Cash crops include coffee, cotton and sisal.

7. Fruit Crop Index is scored as the number of different types of fruit which are grown. Fruit crops are chiefly for home consumption. These include bananas, oranges and lemons.

8. Intensification of tillage is the degree to which a farmer's collective land holdings are under cultivation. Operationally, it is the proportion of land broken for cultivation of all land possessed in the village location.

9. Agricultural innovativeness is the degree to which an individual farmer is relatively earlier in adopting new agricultural ideas than other members of his social system. Operationally, agricultural innovativeness was measured by an adoption scale composed of the adoption versus non-adoption of such new ideas as row-cropping, farm fertilization, regular weeding, fencing farm animals, and division of land into fields. To determine adoption and non-adoption of these practices, one crop type, maize, which is grown by all the respondents in the sample and is also both a major food and cash crop, was singled out for examination. The adoption scale, therefore, refers to the degree to which the new ideas were applied to the maize crop.

10. Group participation is the degree to which household unit members participate in group activities which conduce to the adoption of better farm practices. Operationally, group

participation is the sum of scores obtained by a farmer in response to questions dealing with specified activities in which the farmer or any member of his family participated. The question asked was:

"Have you or any member of this household attended or participated in any of the following activities since last June?"

1. Co-operative Meeting
2. Farmers' Field Day
3. Agricultural Demonstration
4. Animal Husbandry Demonstration
5. Farmers' Training Course.

Education Variables

1. Educational level of head of household was scored as the self-reported level of education in school years completed by the head of household.

2. Functional literacy is the degree to which an individual has achieved mastery of symbols in their written form (Rogers, 1966). A functional literacy test was designed consisting of a simple sentence in English and several vernaculars printed on a card. Respondents were required to demonstrate comprehension by responding to probe questions concerning the content of the message*. The message itself was so designed as to elicit an immediate and usually quite forceful reaction

from the respondents inasmuch as it dwelt upon a matter of current controversy at the time field work was being conducted. The message on the card* was:

"Men in Kenya do not need more than one wife. Do you agree or disagree?"

0. Unable to comprehend message in English or Vernacular

1. Able to comprehend message in Vernacular only

2. Able to comprehend message in English

3. Educational aspiration for children is the level of education to which an individual aspires for his children. Educational aspiration was measured by asking respondents the number of years of schooling they would like both their sons and daughters to have.

4. Proportion of literates in the household unit was scored as the ratio of the number of household members aged 12 years and over who were literate over all household members aged 12 years and over.

5. Proportion of school attenders in the household unit was scored as the ratio of the number of all children aged six through sixteen years in the household enrolled in school in the past year, over the total number of eligible school-goers in that age group.

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*Initially, respondents were handed the card upside down. Turning the card right side up categorized respondents in a higher level of literacy than failing to do so. Further degree of functional literacy in either English or a vernacular was indicated by the respondent's ability to read and respond to questions. Unfortunately, only the end result, ability to read English or a vernacular, was coded.

6. Adult education participation was scored as the number in the household unit of adults aged 16 years and over, who had attended a school during the past year.

Health Variables

1. Proportion of deaths in family unit was scored as the ratio of the number of deaths occuring during the past year in the household unit, over the total number of members of the family unit,deceased persons included.

2. Home innovativeness refers to the degree with which the individual farmer uses preventative measures to guard against the spread of diseases. Operationally, it is a scale made up of two practices perceived as new by the respondent: the adoption or non-adoption of an open or closed pit latrine, and the adoption or non-adoption of a compost pit for disposal of household waste.

Socio-Psychological Variables

1. Achievement motivation or need for achievement is defined by McClelland (1958) as "The desire to do well, not so much for the sake of social recognition or prestige, but to attain an inner feeling of personal accomplishment". Operationally, it is the sum of scores for a respondent in response to a number of projective questions treating of various aspects of achievement. A typical item was:

"A young man was telling his friend about his future plans. He said, "One day I shall be a great man, such as a D.C. or a doctor or maybe even a Government minister". Two old men heard him. One said"It is good to have such dreams, but poor people such as yourself need to have friends in high places who can help them win these dreams". The other old man said, "It is good to have such dreams, but only hard work on your part can win you these dreams. You cannot depend on other people to help you win them". Which old man spoke the wiser words to the young man?

0. First old man (Low achievement motivation)
1. Second old man (High achievement motivation)

2. Cosmopoliteness is the degree to which an individual's orientation is external to a particular social system. Operationally, it is the size of urban centre, in terms of population, visited at least once in the respondent's lifetime. The question asked was:

"Would you name all the towns in East Africa you have been to in your lifetime?"

0. Never been outside location
1. Visited small market towns (population 5,000 and under)
2. Visited big regional commercial centers (population 5,000 and over)
3. Visited national capital city (Nairobi, Dar es Salaam or Kampala)

3. Non-opinionatedness is the degree to which an individual does not have, or refrains from expressing, opinions. Operationally, it is the number of "don't know" responses given by a respondent on fourteen opinion questions in the schedule. A typical opinion question was:

"In your opinion, what is the best thing about land consolidation?"

0. Positive or negative response

1. Don't know

4. Occupational satisfaction is the degree to which the farmer is satisfied with his occupation. Operationally, it is the farmer's perception of farming as a desirable occupation for young men. The question asked was:

"Supposing a young man of about sixteen years from this area who has just finished primary schooling came to you for advice about whether he should go into farming or do something else. What would you advise him to do?"

0. Do something else

1. Go into farming

5. Occupational status is the degree to which the farmer perceives farming as an occupation of status comparable to other status-bearing occupations. Operationally, it is the farmer's perception of the need for highly educated farmers. The question asked was:

"Some people say that the more schooling a person gets, the better off as a farmer as a farmer will he be than others;

and others say that more schooling may be a fine thing for some people, but it is not necessary for the average farmer. What do you say?"

0. More schooling not necessary

1. Better off with more schooling

6. Attitude to tribal customs indicates the degree to which an individual is willing to change his cultural values and orientations. The variable was operationalized in two different ways, one more specific than the other. In the first instance, the respondent indicated all those tribal customs which he considered dispensable. In the second, he indicated whether he considered polygamy per se dispensable. For example, the question asked about polygamy was:

"Men in Kenya do not need more than one wife. Do you agree or disagree?"

0. Agree

1. Disagree

Scale Construction

Unidimensionality of Scales

Certain of the variables described previously, such as achievement motivation, agricultural innovativeness, level of living, and the crop indices are sums of scores on individual items which go together to comprise a total score. On the

one hand, the use of scales would seem to be inadvisable for submission to factor analysis, inasmuch as each item could have been submitted individually to factor analysis. It may be that the items would load more purely than the scales on a factor, even though they would probably have lower commonalities. On the other hand, while each item may have the ability to discriminate among persons on an attribute, that item, nevertheless, still contains error which is specific to itself. If, however, that item was entered into a total score along with several other related items, the tendency is for the item-specific variances to cancel out across items, provided the items are measuring the same dimension. Thus, assuming such cancellations, the total score should then be a relatively purer measure of what each item is measuring, and consequently, a better discriminator among people than each item.

The total score, however, is still no better than the items which make it up. Therefore, it is necessary not only to take account of the degree to which each item taps the common variance in the total score, but also to determine the degree of commonality an item has with every other item in the scale.

Thus, each item score was initially correlated with the total score, and items were selected on the basis of higher item-to-total score correlations. However, item-to-total score

correlations are by themselves insufficient demonstrations of unidimensionality, inasmuch as it is possible that each item correlates highly and positively with the total score, while at the same time failing to intercorrelate with some of the other items in the scale, thereby suggesting that some other factors are operating. Therefore, an additional procedure for testing unidimensionality of scale items was utilized. It involved the construction of inter-item correlation matrices, the inclusion of matrix reflects, and the summing of correlation coefficients by matrix columns*. The column sums were then averaged and only those items which yielded an average correlation which met significance at the one percent level were retained in the scale.

As a final check on unidimensionality, the items then remaining in each scale were submitted to McQuitty's (1957) elementary linkage analysis, a method which is analogous to factor analysis. If all the items indeed tap a single dimension, they should, by the linking method, all join to form a cluster. All items in each index, inter-linked with each other, thus confirm the unidimensionality of the scales.

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*Prior to summing and averaging correlation coefficients, each was transformed to a Fisher's Z.

Data Analysis

Factor Analysis

The correlation matrices for each of the three villages and for all the villages considered collectively as a single unit, were submitted separately to a principal-axis factor analysis with Varimax rotations. Thus, four separate solutions were yielded: one pertaining to the villages taken collectively, and three pertaining to the three villages taken individually.

The Kiel-Wrigley (1960) criterion for terminating factor rotation was adopted. Under this procedure, rotation of factors is continued as long as each factor contains at least three items whose highest loadings are on that factor.

All variables used in the analyses are assumed to have an underlying interval quality which renders them amenable to product moment correlational analysis.

Factor Similarities

The individual village analyses were performed in order that comparisons could be made across the villages regarding the number and structure of factors that were uncovered by factor analysis. The factor similarity matrices were obtained in order to determine the degree to which the factors, that were extracted from each village analysis, were similar across the three villages. They offered a less subjective

criterion for comparing factor structures across the villages. Factors were said to be similar when they met a minimum criterion of "good fit"*.

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*The lower bounds of good fit are estimated by the fraction: $\frac{1 + \frac{1}{\sqrt{k}}}{2}$ where k is the number of factors in the solution being compared.

CHAPTER IV

FINDINGS

Results of Factor Analysis

The principle axis solution with Varimax rotations using the Kiel-Wrigley (1960) criterion for terminating factor rotations, yielded results shown in Table 1.

Table 1. Number of Factors and Variance Explained by Village Using the Kiel-Wrigley Criterion for Terminating Rotations

Village	No. of Factors	Range of Variance Explained per Factor	Percent of Total Variance Explained
Samia	9	4.4% to 9.7%	52.84%
Kabondo	7	4.1% to 11.4%	46.92%
Bomet	8	4.1% to 8.0%	46.95%
Combined Villages	7	4.3% to 8.7%	44.59%

Each factor analysis yielded a multiplicity of factors with no one factor emerging as much more dominant than the others in terms of proportion of total variance explained. Thus, the expectation that the variables constituted a single dimension in factor space, which reasonably explained most of the variance among the 43 variables and which could have been labeled modernization, was not realized. Modernization at the individual level of analysis appears to be multi-dimensional; i.e., modernization appears to vary in more than one way.

Many variables failed to load substantially more on one factor than on others, tending rather to diffuse their loadings across more than one factor. Thus, for many variables, a relatively low degree of factor purity was achieved. For these variables, the author attempted to trace their histories of loadings and the points at which they "broke away" from factors through each successive rotation. Following this procedure for many variables across four separate analyses becomes extremely unwieldy and is suffused with an inordinate amount of subjectivity. As a way to circumvent these difficulties, the factor similarity matrices across the four factor analyses were examined rotation by rotation. By this means, the rotation which yielded five factors in each analysis was indicated as having the highest degree of similarity of factors across all the four analyses. Using this criterion for terminating rotations in preference to the Kiel-Wrigley criterion, the results shown in Table 2 were obtained.

Table 2. Number of Factors and Variance Explained by Village Using the Factor Similarity Criterion for Terminating Rotations

Village	No. of Factors	Range of Variance Explained per Factor	Percent of Total Variance Explained
Samia	5	5.1% to 10.0%	37.9%
Kabondo	5	5.9% to 12.2%	39.2%
Bomet	5	5.1% to 10.0%	35.7%
Combined Villages	5	5.0% to 9.1%	37.7%

Thus, the five-factor solutions for each of the four intercorrelation matrices were adopted as the most appropriate solutions. Each of the five-factor solutions explained slightly more than a third of the total variance in each of the matrices. As each factor is introduced and identified, a matrix of the factor similarities for that factor across the three villages will be presented.

Patterns of Modernization Variables

Before introducing the factors, a brief explanation of the information to be supplied in the Appendices will be presented.

Short descriptions of the variables are presented at the left of each table.

The first column represents the primary factor loadings, i.e., the correlations between each variable and the factor on which it loads highest.

The second column represents secondary factor loadings, i.e., the highest other loadings of the variables on some other factor. This column is presented in order to provide some indication of the factor purity of each variable. If a variable has a high primary loading and low secondary loadings, that variable is said to be factorially "pure" on one factor. As the primary and secondary loadings approach each other in numerical magnitude, the factor purities decrease; the

variable concerned is said to be factorially "complex" inasmuch as it is loaded on more than one factor.

The third column identifies the factor on which the second highest loading is located.

The final column is the communality (h^2) for each variable, indicating the amount of variance in that variable, which has been explained by all the factors in the analysis.

It is also necessary to discuss briefly, prior to the introduction of the factors, the findings regarding the use of variables which are either ratios of two scores, or are combinations of two or more separate scores. The evidence seems to indicate that the use of ratios and indices do not tend to result in loadings which are factorially "pure". For example, looking at factor one in Samia (Appendix, Table1), the items, proportion of school-goers in the household, and proportion of adults in the household, have relatively low primary loadings and relatively high secondary loadings. Similarly, looking at factor two in Samia (Appendix, Table 1), the items: total household income from all sources, farm implements index, and level of living, all have relatively high secondary loadings, suggesting a relatively high degree of factor complexity in their loadings. While a number of ratios (for example, proportion of literates in household, Samia factor one) and indices (for example, group participation and agricultural innovativeness, Samia factor two) indicate relatively high factor purities and commonalities, the

tendency is, nevertheless, for scales and indices to be relatively more factorially complex than other items in the analyses. It seems, therefore, that submitting the individual items from which the indices and the ratios were derived might have proved more useful to the factor analyses.

Dimension I. Ability to Understand Communication

The first dimension has been named Ability to Understand Communication because, as is evident from Table 3, it contains chiefly items which relate closely to the individual's acquired abilities to encode and decode symbols, especially in their written form.

Table 3. Comparisons of Highest* Primary Loadings on Ability to Understand Communications

Variables	Samia Factor 1	Kabondo Factor 2	Bomet Factor 1	Combined Villages Factor 1
Functional Literacy	.30	.35	.67	.32
Education	.73	.77	.58	.73
Literates in Family	.69	.62	.62	.64
Magazine Exposure	.69	.62	.60	.63
Newspaper Exposure	.59	.72	.43	.60
Radio Exposure	.44	.56	.57	.49

*See tables in Appendix for loadings of other variables on Dimension 1.

A more limited label might have been simply Literacy-Education. However, the coming together of the literacy, education, and mass media exposure variables in the first dimension expresses rather clearly the individual's abilities to encode and decode messages intelligently inasmuch as such variables subsume these abilities. Rogers (1966) looked upon literacy as the "catalyst of modernization, 'unfreezing' the mass media communication channels for the individual". Lerner, (1958, p.61-65) stated that increasing numbers of literates in a community occasioned increasing participation in the mass media, especially the print deia, and hence, contributed substantially to the modernization of that community. These observations underscore literacy and media exposure as being among the most crucial elements in the process of modernization.

Education and literacy are items which are manifestly related. Indeed, literacy is most frequently acquired by the individual in the process of acquiring a formal education. In a sense, the inclusion of both education and literacy in the factor analysis predestined the emergence of these two variables in one factor. However, they are not completely identical, since, in the three villages, some literates professed to have no schooling while some schooled individuals failed to demonstrate literacy.

It can be observed from an examination of the tables in

the Appendix that the electronic media indices, radio and cinema exposure, tend generally to have much lower loadings on the ability to understand communication dimension than do the print mdeia indices, newspaper and magazine exposure. In fact, cinema exposure tends generally to have only its secondary loading going together with the other mass media exposure indices. The electronic media do not require as much of the decoding skills provided by literacy and education as do the print media. They are related, however, in that literate and/or schooled individuals tend to have greater economic ability and, therefore, greater opportunity to attend to the electronic media than do illiterate and/or unschooled persons.

The differences between the villages on the first dimension concern mainly those variables with low loadings on this dimension. In Samia (Appendix, Table I, Factor 1), the ability to understand communications is a bipolar factor, with age at one pole and literacy at the other. Age, while not having its primary loading on this dimension in the other villages, was, nevertheless, negatively correlated with the dimension. This reflects the basic negative relationship between those two variables. In Samia, as in most parts of the world, the younger the individual, the more likely he is to be literate.

As is evident in the tables in the Appendix, other low

loading variables on the first dimension involve mainly variables which are ratios of two scores or are combinations of two or more separate scores and, therefore, tend to be factorially complex.

The dimension, ability to understand communication, attained a remarkable degree of similarity of factors across the three villages, as is evident from the findings of Table 4.

Table 4. Factor Similarity Matrix: Ability to Understand Communication

	Samia Factor 1	Kabondo Factor 2	Bomet Factor 1
Combined Villages (Factor 1)	.94*	.95*	.90*
Samia (Factor 1)	--	.86*	.83*
Kabondo (Factor 2)		--	.84*

* Lower bounds of good fit: .72

Each of the entries in the matrix exceed the lower bounds of good fit, thus indicating that each village compared very favorably with every other village on the dimension: ability to understand communication.

Dimension 2: Family Structure

The second dimension has been named Family Structure because it contains mainly items which pertain to the structural configuration of the family unit.

Table 5. Comparisons of Highest** Primary Loadings on Family Structure

Variables	Samia Factor 3	Kabondo Factor 1	Bomet Factor 2	Combined Villages Factor 3
Household Size	.75	.76	.80	.82
Complexity of Family	.65	.66	.61	.73
Age of Head	.41*	.56	.68	.57
Farm Size	.57	.40	.45	.50

* Secondary loading with primary loading on some other factor.

** See tables in Appendix for loadings of other variables on Dimension 2.

The number of members in the household unit and the complexity of the extended family unit in terms of the number of persons designated as "housewives" living in the household, load highest on the family structure dimension. Large families tend to be complex or extended families. The heads of large families tend to be older rather than younger persons. Older persons tend to be more steeped in tradition than younger persons are, and therefore, they are the more likely persons to practise polygamy and to encourage its practice among their sons. The presence of an elderly head-of-household also indicates that the family land holdings have, as yet, not been subdivided among the male children. Hence, large families tend to have more land than small families.

The household size and age of head-of-household items in the family structure dimension tend to load negatively on the

four other factors in each of the villages. We would expect the family structure dimension, therefore, to be negatively related with the process of modernization i.e., large,complex families with elderly heads-of-household tend to be associated with traditionalism rather than with modernity. Subsumed in the family structure dimension, is the notion of familism, the polar opposite of which may be conceptualized as individualism. Rogers (1965) noted that a strong sense of familism, wherein individual aspirations are subordinated to those of the family unit as a whole, tends to restrict the process of development. Generally, decisions to venture into the realm of the novel are contingent upon a joint decision of all family members, frequently under the authoritarianism of a patriarch. It is reasonable to expect, therefore, that this condition is increasingly aggravated in situations of increasing size and complexity of family structure, wherein a great many people must interact to reach a decision.

As is evident from the tables in the Appendix, the lower loadings on the family structure dimension are provided generally by such items as the number of adult education students in the household, proportion of school-goers in the household, number of family members away working, farm fragmentation and sex. Each of these items are logically based in some aspect of the structure of the family. Since the families are larger, including many children of younger married sons, there is greater likelihood of more children

to be attending school than would be the case in nuclear families, the heads of which tend to be young and, therefore, likely to be without children of school-going age. Also, since the families are large, there is a greater likelihood of more individuals being available to work away from home than if the family was small.

The family structure dimension, like the ability to understand communication dimension, also attained a remarkable degree of factor similarity across the three villages, as evidenced in Table 6.

Table 6. Factor Similarity Matrix: Family Structure

	Samia Factor 3	Kabondo Factor 1	Bomet Factor 2
Combined Villages (Factor 3)	.89*	.87*	.84*
Samia (Factor 3)	--	.72*	.73*
Kabondo (Factor 1)		--	.76*

* Lower bounds of good fit: .72

All the entries in the matrix exceeded the lower bounds of good fit, thereby indicating that the dimension, family structure, was very similar across villages.

Dimension 3: Receptiveness to Change

The third dimension has been labeled receptiveness to change principally because most of the items which load on it

are oriented in the direction of change toward modernization.

Table 7. Comparisons of Highest** Primary Loadings on Receptiveness to Change

Variable	Samia Factor 2	Kabondo Factor 4	Bomet Factor 3	Combined Villages Factor 4
Change Agent Contact (Agent initiated)	.70	.69	.58	.73
Change Agent Contact (Client initiated)	.64	.65	.49	.73
Agricultural Innovativeness	.64	.29*	.29*	.60

* Secondary loading with primary loading on some other factor.

** See tables in Appendix for loadings of other variables on Dimension 3.

The emphasis appears to be strongly upon the interaction between individual farmers and professional agents of directed social and technological change, such as the agricultural officer, the veterinary officer and the community development officer. Contact with other sources of influence is also in evidence. In Samia (Appendix, Table I, Factor 2), group participation involving such meetings as farmers' field days and agricultural demonstrations is highly loaded on the receptiveness to change dimension. In Bomet (Appendix, Table 3, Factor 3), cosmopoliteness loads even more highly than change agent contact on the dimension, while in Kabondo (Appendix, Table 2, Factor 4), cosmopoliteness has its primary, though

very low loading, on the receptiveness to change dimension. Cosmopoliteness suggests gregariousness which acts to bring individuals into contact with sources of influence to change which are external to the individual's social system.

In the combined villages (Appendix, Table 4, Factor 4), as in Samia, interaction with agents of change is accompanied by agricultural innovativeness and home innovativeness. In Kabondo and Bomet, agricultural innovativeness has its highest other loading on receptiveness to change dimension, its primary loading, in both cases, being on agricultural productivity.

Thus, individuals who tend to evince a propensity to innovate also tend to seek contact with both formal and informal agents of change. At the same time, professional agents of change actively seek out farmers who are apparently receptive to influences of change in ways which are indicated as desirable in the eyes of the change agent. The change agent, therefore, is of central concern to the modernizing process because his is the responsibility not only of fostering, but also of arousing within individuals this receptivity to change.

Table 8 shows that Samia and Kabondo indicate a greater degree of factor similarity between themselves than either of them do with Bomet on the receptivity to change dimension. The entries for Bomet in the matrix are all markedly below the lower bounds of good fit.

Table 8. Factor Similarity Matrix: Receptivity to Change

	Samia Factor 2	Kabondo Factor 4	Bomet Factor 3
Combined Villages (Factor 4)	.86*	.71	.50
Samia (Factor 2)	--	.69	.30
Kabondo (Factor 4)		--	.21

* Lower bounds of good fit: .72

Bomet differs from the other two villages mainly in terms of the items which load highest on the receptivity to change dimension (Appendix, Table 4, Factor 3). The items: sex and cosmopoliteness are loaded highest on this dimension, backed by a fairly high loading for the items: members away working. Males in Bomet tend to be gregarious. They go out periodically to work in the cities and on the white settler farms, returning to their homes during the planting season. Their gregariousness stems from their history of pastoralism which drove them hither and thither in search for fresh grazing lands. It has been noticed in Kenya that there are more buses running between the Kalenjin areas (the Kipsigis are one of the Kalenjin tribes) and the cities than between any other areas and the cities.

However, the nature of the receptiveness to change factor in Bomet remains logically very similar to the corresponding factors in Samia and Kabondo, inasmuch as all three of them

appear to emphasize interaction between sources of influence to change and individual peasant farmers.

Dimension 4: Aspirational Orientation

The fourth dimension has been named Aspirational Orientation primarily because aspirational level, vicariously expressed by way of educational aspirations for children, loads highest in all three villages on this dimension, as is evident from Table 9. Also, achievement motivation and the degree of an individual's inability or unwillingness to assert his opinions, tend to be associated with the level of that individual's aspirations.

Table 9. Comparisons of Highest** Primary Loadings on Aspirational Orientation

Variable	Samia Factor 4	Kabondo Factor 3	Bomet Factor 4	Combined Villages Factor 5
Educational Aspiration: Son	.69	.70	.69	.74
Educational Aspiration: Daughter	.57	.69	.72	.72
Achievement Motivation	--	.60	.16*	.55
Non-opinionatedness	--	-.59	-.48	-.36

* Secondary loading with primary loading on some other factor.

** See tables in Appendix for loadings of other variables on Dimension 4.

Social scientists are in general agreement that an understanding of the values of a social system is necessary to the explanation and prediction of human behavior. The aspirational orientation dimension emphasizes the need to take account of value orientations, especially those which tend to arouse within individuals a desire for excellence in the sense of some hoped for future accomplishment, either for themselves personally, or vicariously through their children.

Thus, a new way of life expresses, basically, the acquisition of a new outlook on life. The individual in a developing society can, apparently, no longer afford a fatalistic view of life: he must learn, as Rogers (1965) stated, to defer immediate gratification in anticipation of future rewards. He must look to the road of change ahead, instead of fixing his attention on the rear-view mirror (Rogers, 1962. p.171).

In Samia (Appendix, Table I, Factor 5), the items, achievement motivation and non-opinionatedness, both loaded highest on a fifth dimension, agricultural productivity, seemingly breaking the aspirational orientation dimension in two. In Samia, therefore, an individual's educational aspiration for his children loads highest on a different dimension to his need for personal achievement. This observation seems also to apply in some measure to Bomet (Appendix, Table 4, Factor 5), where achievement motivation had a low secondary loading on the aspirational orientation dimension, having its

primary, though still low loading, on the agricultural productivity dimension.

As can be seen in Table 10, moderate to high degrees of factor similarities between each village and the combined villages are in evidence, but inter-village similarities of factors on the aspirational orientation dimension are generally low.

Table 10. Factor Similarity Matrix: Aspirational Orientation

	Samia Factor 4	Kabondo Factor 3	Bomet Factor 4
Combined Villages (Factor 5)	.60	.87*	.62
Samia (Factor 4)	--	.43	.30
Kabondo (Factor 3)		--	.50

* Lower bounds of good fit: .72

All but one of the entries in the matrix were below the lower bounds of best fit. Indeed, each village indicated greater similarity with the combined villages than among themselves on the aspirational orientation dimension.

Dimension 5: Agricultural Productivity

The fifth and final dimension has been labeled Agricultural Productivity (Table II) because it contains mainly items which relate to the kind of output the farm operator has.

Table 11. Comparisons of Highest** Primary Loadings on Agricultural Productivity

Variable	Samia Factor 5	Kabondo Factor 5	Bomet Factor 5	Combined Villages Factor 2
Inherited Crop Index	--	--	.70	.80
Cash Crop Index	.22*	--	.64	.74
Fruit Crop Index	.33	--	.71	.67
Intensification of Tillage	.24	.41	--	.56
Commercialization of Farm Products	--	.68	.39	.33
Agricultural Innovativeness	.21*	.57	.35	.53*
Farm Implements Index	--	.41	.26	--

* Secondary loading with primary loading on some other factor

**See tables in Appendix for loadings of other variables on Dimension 5.

However, the nature of the agricultural productivity dimension across the three villages is not very clear. Firstly, there is not sufficient evidence to support the naming of any of the five factors in Samia as agricultural productivity (Appendix, Table I). The items relating to the kind of agricultural output a farmer has are scattered across such factors as receptiveness to change and aspirational orientations. As a result, no factor in Samia was named agricultural

productivity. Instead, the fifth factor, on which non-opinionatedness and achievement motivation loaded highest, was named motivational orientation (Appendix, Table I, Factor 5). It is noted, however, that some productivity indices such as intensification of tillage and fruit crop index did have their highest, though low loadings on the motivational orientation dimension while others, such as cash crop index and agricultural innovativeness had their secondary loading on this dimension.

Secondly, while the various crop indices emerged with very high loadings on this dimension in the combined villages and in Bomet, the same did not hold for Kabondo, where the crop indices tended to go with aspirational orientation. In Kabondo, commercialization of farm products, backed by agricultural innovativeness, had their highest loadings on the agricultural productivity dimension.

The diffuseness of the agricultural productivity dimension may result in great part from the difficulty of obtaining reliable statements of agricultural output and income from people who are largely dependent upon the vagaries of memory for the maintenance of records. For example, frequently, farmers knew neither the exact size of their land holdings, nor the size of their land which had been brought under cultivation. The intensification of tillage variable is a ratio of total land under cultivation over total land owned, both relatively imprecise estimates. Similarly, the item,

commercialization of farm products is a ratio of a relatively gross estimate of total amount of crops sold over a relatively gross estimate of total crops harvested in a given period of time.

The dimension also reveals, to some extent, the basic dilemma which concerns people in the process of transition from traditional systems to commercial patterns of farming. The inherited crop index goes together with the cash crop index. The tendency in a modern agricultural setting is to select an ecologically appropriate cash crop and to specialize in it to the almost total exclusion of all other crop types. In transitional societies, appropriate cash crops are adopted, but the opposing forces of traditionalism engender a reluctance on the part of the peasant farmer to abandon the customary cultivation of diversified crop types which he has inherited from his forefathers.

Withal, items which have their primary loadings on the agricultural productivity dimension, impart a fairly strong aura of farm economics and productivity. Farmers who practice greater crop diversification can be expected to have brought greater proportions of their land under tillage. Farmers who are growing cash crops tend to be more innovative than those who are not. They also tend to sell their crops commercially. Religion plays its role in agricultural productivity, insofar as it is the Christian missionary who is the village educator

and encourager of agricultural development.

However, it is evident, as shown in Table 12, that the factors bear a low similarity to each other across villages.

Table 12. Factor Similarity Matrix: Agricultural Productivity

	Samia Factor 5	Kabondo Factor 5	Bomet Factor 5
Combined Villages (Factor 5)	.47	.14	.46
Samia (Factor 5)	.--	.18	.31
Kabondo		--	.44

* Lower bounds of good fit: .72

All of the entries in the matrix are well below the lower bounds of good fit.

CHAPTER V

SUMMARY AND DISCUSSION

Summary

The objectives of the present study were the exploration of the data from three Kenya village locations with a view to determining meaningful dimensions which can be used in explaining and predicting the process of transition from traditional subsistence to modern commercial systems of farming in predominantly agrarian peasant communities. This transitional process was labeled the process of modernization. Specifically, it was intended to determine whether or not, by factor analysis, a large number of variables bearing upon the process of modernization could be reduced to one factor structure which adequately described the process of modernization. That is, it was intended to determine whether or not there is a unidimensional phenomenon, which might appropriately be labeled modernization.

Personal interviews with 624 heads-of-household were conducted in three village locations in Kenya. Area sampling techniques were used to locate final informants who responded to a pre-tested interview schedule administered by specially selected County Council Community Development assistants under the direct supervision of trained personnel.

Factors ranging in number from seven to nine were extracted

from the 43 variable intercorrelation matrices, using the Kiel-Wrigley criterion. These were reduced to five in each village and in the combined sample by the application of a second arbitrary criterion derived from the factor similarity matrices. In each village location, about one third of the total variance was explained by each of the five-factor solutions.

However, no one factor in any of the village locations predominated sufficiently over the other factors in terms of proportion of total variance explained. Thus, no one factor could be considered as reasonably explaining most of the variance in the intercorrelation matrices. Therefore, the expectation of one major underlying dimension which could be named modernization, was not realized. Modernization, it would seem, is multi-dimensional, having at least five dimensions discernable from the variables that were examined.

The dimensions which were extracted were indeed meaningful. These have been named: ability to understand communication, family structure, receptiveness to change, aspirational orientation, and agricultural productivity. The ability to understand communication and family structure dimensions were highly similar across villages. The receptiveness to change and aspirational orientation dimensions attained moderate similarity across villages while the agricultural productivity dimension indicated the least similarity across the three villages.

Discussion

Comparisons of Factor Analytic Investigations

Farace (1965) found that, by factor analysis, 54 variables representing different aspects of life in 109 countries could be reasonably explained by one principal underlying dimension in terms of proportion of total variance explained in the 54 by 54 intercorrelation matrix. Deutschmann and Falls Borda (1963) found that, by factor analysis, 23 variables treating of different aspects of life among the peasant farmers of an Andean village in Colombia, a total of nine factors could be extracted, none of which predominated over the others in terms of total variance explained in the 23 by 23 intercorrelation matrix, and, consequently, none of which could reasonably be considered as adequately describing the process of innovativeness. The present study uncovered five factors in each of three Kenya village locations, with no one factor explaining more of the total variance in the 43 by 43 intercorrelation matrices than others.

At first glance, one may be led to conclude that, inasmuch as the Farace study utilized modal characteristics of nations while the latter two studies utilized individual peasant farmers as units of analysis, it would seem to be possible to explain differences in levels of development among nations on the basis of an unidimensional underlying factor,

whereas the same does not appear to apply in the case of individuals. One may further support this contention by arguing that a nation developing in one aspect of its lifeways, also tends to be simultaneously developing in a substantial number of other aspects. This is so because a nation usually plans its development systematically, frequently modeling it on the basis of other, more developed nations. There are also a number of developmental aspects which a nation is constrained to adopt simply to conform with international practice. Telephone systems and airports might be necessary for the maintenance of efficient international relations, but may be of minimum utility for the efficient maintenance of domestic affairs. Moreover, nations keep records of their plans, their rates of development, and, by international convention, are constrained to keep records on the basic set of "core" variables relating to various aspects of their lifeways.

At the individual peasant farmer level, one may argue that development is considerably more complex. Whereas there was only one dimension to consider in the aggregate study, there are now a multiplicity of dimensions to consider when the individual is the unit of analysis. Thus, while it is still true that an individual developing in one aspect of one dimension will tend to be developing simultaneously in all other aspects of that dimension, it would at the same time appear to be

possible for an individual to be developing along one or more dimensions of modernity while failing to develop along other dimensions. The peasant farmer tends not to keep records of his activities, nor does he tend to plan his development systematically. Moreover, social scientists who are intent upon determining the level of development of peasant farmers tend to delve into a broader spectrum of the farmers' characteristics than do social scientists interested in national levels of development. The latter scientists are dependent upon a rather restricted set of available data for their analyses.

Having considered these points, one may reasonably hold the expectation that, at the macro level of investigation, there is a high probability of extracting one principal dimension wherein the majority of variables tend to go together, whereas at the micro level of investigation, there is a high probability of extracting a multiplicity of factors underlying the variables.

Such an expectation is speculatory and the data at hand do not provide adequate substantiation of it. The present investigation and the Deutschmann and Falls Borda study utilized relatively homogeneous units of analysis i.e. peasant farmers, whereas the Farace aggregate study used relatively heterogeneous units of analysis i.e. nations in all stages of development. A better comparison of the aggregate study with a study using more elemental units of analysis might have

been when the units in the latter type of study constituted a national probability sample of all individuals in the nation in every stage of development i.e. when the elemental units of analysis are relatively heterogeneous.

There are, however, other probably more germane explanations for the observed differences regarding the number of factors extracted from aggregate data on the one hand and from data from individual units of analysis on the other.

Firstly, the choice of variables to be submitted to factor analysis is a matter of quite considerable subjectivity. Deutschmann and Falls Borda (1963, p.87) stated that "Any particular factor analysis is, of course, a product of the particular variables chosen for a particular study". Thus, it is possible for two independent researchers, both focussing on one common problem, to select very different sets of variables for submission to factor analysis. To quite a considerable extent, this has been the case in respect of the three studies under discussion, i.e., the Farace (1965) study, the Deutschmann/Falls Borda (1963) study and the present investigation. They do not all three of them include exactly the same variables operationalized in exactly the same way. There is some overlap, but the areas of non-overlap are greater.

Secondly, the choice of methods for rotating the principal axis solution to achieve simple structure is a

matter of quite considerable subjectivity. The Farace (1965) study utilized oblique rotations which tend to minimize the number of factors extracted, since obliqueness (i.e., factor axes are allowed to form acute or obtuse angles) means that factors are correlated. Deutschmann and Falls Borda and the present study both used orthogonal rotations, namely, Varimax rotations. Orthogonal rotations (i.e., the angles between factor axes are kept at 90 degrees) maintains independence among the factors and tends to increase the number of factors extracted. Thus, when oblique rotations are used, the factors are not constrained to be independent of each other. In fact, because of this freedom, the oblique rotations may indeed reflect a better view of the variables in factor space. Orthogonal rotations, on the other hand, constrain factors to be independent of each other, a condition which might well act to produce a somewhat artificial view of the variables. Whatever the relative advantages of one rotational method over the other, it is, nevertheless, clear that the differences in the numbers of factors extracted in the macro and micro analyses may very likely have been simply an artifact of the rotational method selected to simplify factor structure.

Finally, the choice of criteria for terminating rotations differ from study to study. The Deutschmann and Falls Borda study terminated rotations only when each factor contained at least two items loading highest on it. The present study

initially continued rotations of factors so long as each factor contained at least three items whose highest loadings were on that factor. Clearly, differing numbers of factors would emerge in each study simply as a function of the choice of criteria for terminating rotations.

Comparisons of the nature and number of factor structure across the three studies under discussion, therefore, are very hazardous to make. Factor analysis yields no more than numerical statements about data. It tells us relatively unambiguously that a set of variables cluster or "go together". It cannot tell us why they do so. Interpretation, therefore, is still subject to the vagaries of man. Factor analysts search for "meaningful" dimensions to explain and predict phenomena in which they are interested. What is "meaningful" is still a matter of personal taste.

There is, however, one rather clear area of similarity across the three factor analytic investigations at hand. We have previously seen that the dimension, ability to understand communication, attained a remarkable degree of factor similarity across the three villages in the Kenya study. Substantial reinforcement of the underlying notion of the dimension is provided in the findings of both the Farace study and the Deutschmann and Falls Borda study, as can be seen in Table 13.

Table 13. Comparison of Communication Variables across Six Factor Analytic Investigations

Variables	Samia (F1)	Kabondo (F2)	Bomet (F1)	Combined Villages (F1)	Saucio (F3)	Aggregate (F1)
Literacy	.80*	.85*	.67*	.82*	.86*	--
Education	.78	.77	.58	.78	.81	--
Magazine Exposure	.69	.62	.60	.63	--	--
Newspaper Exposure	.59	.72	.43	.60	--	--
Newsprint Consumption per capita	--	--	--	--	--	.75

* Highest primary loading

The dimension in which the variables in Table 13 load highest in the present study is named ability to understand communication. In the Deutschmann and Falls Borda study, Factor 3 has been identically named. Had the latter study included indices of exposure to mass media channels, we would have expected those to "go together" with literacy and education as they did in the present study. In the Farace study, while literacy, measured as the percent of illiteracy, did not have its primary loading on the principal factor, the mass communication indices did, their primary loadings being nearly as high as the highest loadings (.81) provided by the economic indicators.

The ability to understand communication, therefore, must rank as one of the most crucial dimensions in the process of modernization.

Implications for Future Research

The findings of the present investigation provide much evidence that one may extract at least five meaningful dimensions which underly the process of individual development in traditional village settings characterized by subsistence patterns of farming. There are ambiguities in the results, however, which limit the generalizability of the findings and the defensibility of the conclusions.

The ambiguities may be attributed to the fact that because there were no hypotheses as to the number and nature of the dimensions, there were consequently no criteria for including variables on the basis of their correspondence to the general meaning of a factor. The differences in factor structure, especially across the three villages of Kenya, may have been an artifact, not only of the original selection of variables, but also of the difficulties of attaining precise information using a measuring implement which is solely dependent upon the accuracy and honesty of the respondents' recall.

To investigate these limitations, further analyses using new data is required. In effect, we have now completed the explorative stage and, armed with the information so gained, we are ready to embark upon confirmatory analyses. It is now

necessary to hypothesize the number and nature of dimensions underlying the process of modernization and to test these hypotheses with new data.

On the basis of the findings of the present investigation, it is hypothesized that there are at least five main dimensions in the modernizing process. We are not confident that there are only five factors since we are not confident that we have included a thorough sampling of all the different aspects of the "way of life" of the unit that we analyzed, such that we have tapped, as much as possible, the major sources of variation in that way of life. To test the stability of the five dimensions, therefore, it will be necessary (1) to select variables from a wider range to conform with the general meaning of each factor, under the hypothesis that there are at least five major dimensions to modernization, and (2) to select a number of other variables which may not conform with the general meaning of each of the five dimensions, but which, nevertheless, may bear upon the process of modernization.

The five dimensions of modernization are identified as the ability to understand communications, family structure, receptiveness to change, aspirational orientation and agricultural productivity. Positive relationships to modernization are hypothesized for each dimension except family structure, which is negatively related to modernization.

To a certain extent, Lerner's (1963, p.329) definition of modernity as an interactive behavioral system has been

substantiated. The components of each of the five dimensions are behavioral in the sense that they operate only through the activity of individual human beings. The components of each dimension are interactive, in the sense that the efficient functioning of one of them requires the efficient functioning of all others. The components of each dimension form a system in the sense that significant variation in the activity of one component, such as literacy, will be associated with significant variation in the activity of all other components, such as education, and the various media indices.

The extent to which an individual is high on each of the dimensions which are hypothesized to be positively related with modernization and low on the dimension which is hypothesized to be negatively related, is the extent to which we may predict that such an individual will be modern in relation to other members of his social system. The extent to which an individual decreasingly satisfies this condition, is the extent to which we may predict that he is traditionally oriented in relation to the other members in his social system. The question to be answered, therefore, is: How do the five dimensions "hang together" to enable us to make such predictions? Which of the five dimensions are antecedent and which are consequent, if indeed, it is possible to make such classifications of the dimensions?

The question suggests the next step in the analysis i.e. the correlation of persons with persons on the variables

falling within each of these dimensions. The factor analytic approach which achieves this end is known as P analysis which is a typology of peoples approach dedicated to determining clusters of people possessing a common syndrome, i.e., a heterogeneous complex of traits which are common to a cluster of people. By this means it is possible to rank people along a continuum ranging from "traditional" to "modern" such that people at the "modern" end of the continuum are those who are oriented toward the modern pole on each and every dimension and people at the "traditional" end of the continuum are those who are oriented toward the traditional pole on each and every dimension. Of course, there are n^x combinations of the dimensions into which the respondents could be classified. Our interest, therefore, is to observe which dimensions in what order fall away as we proceed down the continuum from moderns to traditionals.

By way of example, suppose we had a continuum of people from highly modern to highly traditional on the basis of their scores on three factors or dimensions of modernization. Suppose further that we divided this continuum into quartiles to yield four people typologies. Finally, for conceptual reasons, let us suppose that the people in the top quartile were ideally oriented toward the "modern" pole on each of the three dimensions and that the people in the bottom quartile were ideally oriented toward the "traditional" pole on each of the three dimensions. It is clear that the people in each

of the two middle quartiles could take one or more of the combinations which pertain ideally to them, as seen in Table 14.

Table 14. Idealized Combination of Three Hypothetical Dimensions by Four Hypothetical People Types.

	Dimension 1	Dimension 2	Dimension 3
First quartile			
Combination 1	+	+	+
Second quartile			
Combination 1	+	+	-
Combination 2	+	-	+
Combination 3	-	+	+
Third quartile			
Combination 1	+	-	-
Combination 2	-	+	-
Combination 3	-	-	+
Fourth quartile			
Combination 1	-	-	-

Our object is to determine which of the three combinations in each of the two middle quartiles prevails more than the other two combinations in describing the people in that quartile. Suppose that combination one in the second quartile and combination two in the third quartile predominated over the other two combinations in each quartile in their power to describe their respective quartiles. Is it then not conceptually logical to assume time order in the sense that an individual progresses to the third quartile by initially taking on the attributes indicated by dimension two and

further progresses to the second quartile by taking on the attributes suggested by dimension one? Is it, therefore, not logical to assume that the temporal order in which the attributes indicated by each dimension is developed by an individual in the process of becoming modern is first, dimension two, next dimension one and last, dimension three?

On the other hand, it is quite likely that the three dimensions vary together, i.e., a significant variation in the activity of one dimension is associated with significant variation in the activity of all dimensions. In this event, it would not be possible to infer time order. The three dimensions would, in keeping with Lerner's (1963, p.329) definition of modernity, form an "interactive behavioral system".

Thus, whether or not it is possible to infer time order among the five dimensions extracted in the present investigation, i.e., whether or not some of the dimensions are antecedent and others consequent, is a matter for further research. Such further research should, in the final analysis, have the main objective of determining what kinds of programs of change, presented in what ways, are adopted or not adopted by what kinds of people.

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APPENDIX

FACTOR ANALYSES OF MODERNIZATION VARIABLES

Table I. SAMIA Factor Loadings: Five Factor Solution

Factor 1: Ability to Understand Communication	Factor Loading	Highest other Loading	Highest other Factor	h^2
Functional Literacy	.80	.11	5	.65
Education	.78	.12	3	.63
Proportion of Literates in Household	.69	.16	5	.52
Magazine Exposure	.69	.28	5	.60
Newspaper Exposure	.59	.39	5	.56
Age	-.46	.41	3	.42
Radio Exposure	.44	.25	2	.31
Proportion of Adults in Household	-.42	.27	5	.32
Religion	.37	.30	3	.25
Proportion of School-goers in Household	.33	.30	2	.29
Variance Explained 10%				
Factor 2: Receptiveness to Change				
Change Agent Contact (Agent initiated)	.70	.20	1	.56
Group Participation	.65	.19	1	.48
Agricultural Innovativeness	.64	.21	5	.48
Change Agent Contact (Client initiated)	.64	.24	4	.52
Total Household Income; all sources	.57	.42	3	.57
Home Innovativeness	.56	.21	4	.41
Level of Living	.49	.44	1	.49
Commercialization of Farm Products	.47	.10	1	.23
Farm Implements Index	.43	.32	3	.34
Cash Crop Index	.41	.22	5	.23
Inherited Crop Index	.34	.22	3	.23
Variance Explained: 9.7%				

Table I. (continued) SAMIA Factor Loadings: Five Factor Solution

Factor 3: Family Structure	Factor Loading	Highest other Loading	Highest other Factor	h^2
Household Size	.75	-.11	5	.62
Structural Complexity of Family	.65	.29	2	.57
Farm Size	.57	.31	2	.46
Farm Fragmentation	.56	-.28	4	.47
Sex	.44	.43	5	.45
Adult School-goers in Household	.43	.21	4	.28
Members away Working	.39	.08	4	.17
Cosmopoliteness	.32	-.05	5	.10
Variance Explained: 7.5%				
Factor 4: Aspirational Orientation				
Educational Aspiration (Son)	.69	-.16	2	.52
Educational Aspiration (Daughter)	.57	-.36	5	.49
Occupational Status	.49	-.23	2	.32
Occupational Satisfaction	-.40	.22	1	.22
Introduced Crops	.40	.23	2	.24
Proportion Males in Household	-.32	.27	5	.20
Variance Explained: 5.1%				
Factor 5: Motivational Orientation				
Non-opinionatedness	-.61	-.18	1	.47
Achievement Motivation	.52	.13	1	.29
Attitude Toward Monogamy	.43	.36	1	.36
Cinema Exposure	.43	.29	1	.34
Fruit Crop Index	.33	.33	2	.25
Proportion of Deaths in Family Unit	.26	-.25	3	.15
Attitude to Tribal Customs	.24	.21	1	.12
Intensification of Tillage	.24	-.17	3	.11
Variance Explained: 5.6%				

Table 2. KABONDO Factor Loadings: Five Factor Solution

Factor 1: Family Structure	Factor Loading	Highest other Loading	Highest other Factor	h^2
Household Size	.76	.27	2	.67
Structural Complexity of Family	.66	.24	2	.56
Age	.56	-.31	2	.41
Adult School-goers in the Family	.55	.23	5	.38
Proportion of school-goers in the family	.46	.33	3	.37
Attitude toward Monogamy	-.40	.25	2	.31
Farm Size	.40	.38	5	.40
Members away Working	.31	-.11	2	.12
Variance Explained: 7.3%				
Factor 2: Ability to Understand Communication				
Functional Literacy	.85	.15	5	.76
Education	.77	-.12	4	.63
Newspaper Exposure	.72	.25	4	.59
Magazine Exposure	.62	.37	4	.53
Proportion of Literates in Household	.62	.32	5	.58
Level of Living Index	.60	.34	1	.55
Radio Exposure	.56	.20	3	.40
Total Household Income - from all sources	.50	.38	5	.49
Home Innovativeness	.47	.32	5	.54
Religion	.37	.21	3	.24
Proportion of Deaths in Household	-.29	.28	5	.19
Sex	.15	.13	1	.04
Variance Explained: 12.2%				

Table 2 (continued) KABONDO

Factor 3: Aspirational Orientation	Factor Loading	Highest other Loading	Highest other Factor	h^2
Educational Aspiration (Daughter)	.70	.30	.2	.59
Educational Aspiration (Son)	.69	.25	2	.56
Achievement Motivation	.60	.23	2	.42
Non-opinionatedness	-.59	-.17	2	.39
Fruit Crop Index	.50	.20	4	.34
Cash Crop Index	.40	.13	4	.20
Inherited Crop Index	.38	.28	4	.25
Introduced Crop Index	.36	-.19	2	.17
Variance Explained 7.5%				
Factor 4: Receptiveness to Change				
Change Agent Contact (Agent initiated)	.69	.22	5	.61
Cinema Exposure	.65	.29	2	.54
Change Agent Contact (Client initiated)	.65	.22	2	.58
Occupational Status	-.51	.29	3	.49
Occupational Satisfaction	-.33	-.14	1	.15
Farm Fragmentation	.28	-.19	1	.14
Cosmopoliteness	-.24	.23	3	.19
Variance Explained 6.3%				
Factor 5: Agricultural Productivity				
Commercialization of Farm Products	.68	.16	4	.51
Agricultural Innovativeness	.57	.29	4	.55
Intensification of Tillage	.41	-.14	3	.21
Farm Implement Index	.41	.40	1	.49
Group Participation	.40	.22	3	.26
Attitude Toward Tribal Customs	.30	-.26	1	.18
Proportion of Males in Household	.26	-.19	2	.12
Proportion of Adults in Household	-.21	.13	4	.11
Variance Explained: 5.9%				

Table 3. BOMET Factor Loadings: Five Factor Solution

Factor 1: Ability to Understand Communication	Factor Loading	Highest other Loading	Highest other Factor	h^2
Functional Literacy	.67	-.31	3	.68
Proportion of Literates in Household	.62	.25	4	.48
Magazine Exposure	.60	.18	4	.41
Level of Living	.59	.22	5	.42
Education	.58	-.33	2	.57
Radio Exposure	.57	-.26	4	.41
Cinema Exposure	.53	-.31	4	.40
Group Participation	.52	.29	5	.36
Religion	.48	-.24	3	.35
Home Innovativeness	.46	.16	5	.27
Newspaper Exposure	.43	.19	3	.23
Attitude to Tribal Customs	.23	-.07	2	.07
Variance Explained: 10.0%				
Factor 2: Family Structure				
Household Size	.80	-.09	1	.66
Age	.68	-.26	1	.55
Structural Complexity of Family	.61	-.09	4	.39
Proportion of school-goers in the household	.51	.33	1	.39
Adult school-goers in the household	.50	.17	1	.29
Farm Size	.45	.42	5	.39
Proportion of Males in the household	.32	.19	3	.17
Farm Fragmentation	.29	.25	5	.23
Occupational Status	-.24	-.23	1	.18
Intensification of Tillage	-.23	-.12	1	.09
Variance Explained: 7.4%				

Table 3. BOMET (continued) Factor Loadings: Five Factor Solutions

Factor 3: Receptiveness to Change	Factor Loading	Highest other Loading	Highest other Factor	h^2
Sex	.69	.31	2	.59
Cosmopoliteness	.60	.08	5	.38
Change Agent Contact (Agent initiated)	.58	.25	5	.49
Members Away Working	-.54	.15	5	.34
Change Agent Contact (Client initiated)	.49	.26	5	.39
Proportion of Adults in the Household	.35	-.18	1	.19
Attitude to Monogamy	-.28	.26	5	.18
Variance Explained: 6.3%				
Factor 4: Aspirational Orientation				
Educational Aspiration (Daughter)	.72	.13	1	.54
Educational Aspiration (Son)	.69	-.25	3	.38
Non-opinionatedness	-.48	-.11	1	.25
Occupational Satisfaction	.47	.40	3	.44
Proportion of Deaths in the Household	.21	-.15	1	.08
Variance Explained: 5.1%				
Factor 5: Agricultural Productivity				
Fruit Crop Index	.71	.14	1	.53
Inherited Crop Index	.70	.21	1	.54
Cash Crop Index	.64	-.02	2	.41
Introduced Crop Index	.52	.11	4	.29
Commercialization of Farm Products	.39	.24	1	.26
Total Income from all sources	.38	.32	1	.38
Agricultural Innovativeness	.35	.24	1	.26
Farm Implements Index	.26	.22	2	.21
Achievement Motivation	.18	.16	4	.10
Variance Explained: 6.9%				

Table 4. COMBINED VILLAGES Factor Loadings: Five Factor Solution

Factor 1: Ability to Understand Communication	Factor Loading	Highest other Loading	Highest other Factor	h^2
Functional Literacy	.82	.10	4	.69
Education	.78	.12	2	.63
Proportion of Literates in the family	.64	.22	5	.51
Magazine Exposure	.63	.18	4	.46
Newspaper Exposure	.60	.28	2	.47
Level of Living	.52	.29	3	.46
Radio Exposure	.49	.12	4	.27
Proportion of Males in the Household	-.16	.07	4	.04
Variance Explained: 9.1%				
Factor 2: Agricultural Productivity				
Inherited Crop Index	.80	.14	3	.63
Cash Crop Index	.74	.17	3	.58
Fruit Crop Index	.67	.15	5	.49
Intensification of Tillage	.56	.16	4	.36
Religion	.47	.37	1	.37
Group Participation	.43	.27	4	.34
Occupational Status	-.40	.33	5	.31
Proportion of Adults in the Household	.37	-.22	1	.21
Attitude to Tribal Customs	.37	.14	1	.17
Cosmopoliteness	.37	.21	3	.19
Commercialization of Farm Products	.33	.28	4	.22
Attitude to Monogamy	.31	.20	5	.13
Proportion of Deaths in the family	.20	-.17	1	.08
Variance Explained: 9.3%				

Table 4. COMBINED VILLAGES Factor Loadings:Five Factor Solution

Factor 3: Family Structure	Factor Loading	Highest other Loading	Highest other Factor	h^2
Household Size	.82	-.12	2	.70
Structural Complexity of Family	.73	.14	5	.57
Age	.57	-.35	1	.51
Farm Size	.50	.33	4	.37
Adult school-goers in the household	.48	.17	4	.28
Proportion of school-goers in the household	.43	.26	5	.32
Members Away Working	.32	.20	4	.16
Farm Fragmentation	.28	.20	2	.14
Sex	.26	.23	2	.19
Variance Explained: 6.9%				
Factor 4: Receptiveness to Change				
Change Agent Contact (Agent initiated)	.73	.04	1	.62
Agricultural Agent Contact (Client initiated)	.73	.14	2	.67
Agricultural Innovativeness	.60	-.53	2	.68
Farm Implements Index	.55	.20	1	.36
Total Income from all sources	.45	.36	3	.46
Home Innovativeness	.40	.33	1	.35
Cinema Exposure	.37	.25	1	.21
Occupational Satisfaction	.17	-.11	3	.05
Variance Explained: 7.4%				
Factor 5: Aspirational Orientation				
Educational Aspiration (Son)	.74	.16	4	.62
Educational Aspiration (Daughter)	.72	.17	1	.56
Achievement Motivation	.55	.10	4	.33
Non-opnionatedness	-.36	-.28	2	.29
Introduced Crops	.29	.21	4	.15
Variance Explained: 5.0%				