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AN ECONOCOLOGICAL ANALYSIS OF SMALL
FARM MODERNIZATION: ADJUSTMENTS TO
MECHANIZATION IN UPPER VOLTA

Thomas Lachlan Vollrath

Tennessee University

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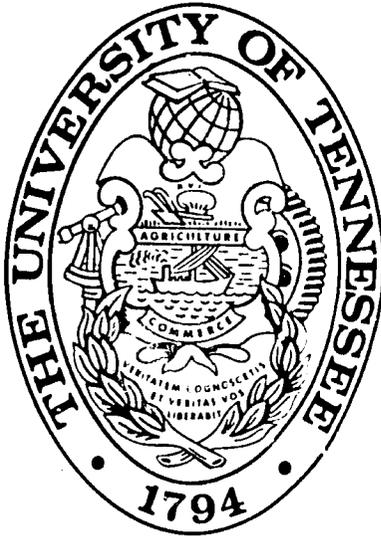
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ADJUSTMENTS TO MECHANIZATION IN UPPER VOLTA

Thomas Lachlan Vollrath

THE UNIVERSITY OF TENNESSEE
Knoxville, Tennessee

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FARM MODERNIZATION: ADJUSTMENTS
TO MECHANIZATION IN UPPER VOLTA

A Thesis
Presented to
the Graduate Council of
The University of Tennessee

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Thomas Lachlan Vollrath

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ABSTRACT

The objectives of this study were (1) to introduce the reader to tillage problems confronting the farmer cultivator in the cercles of Koupela, Tenkodogo, and Garango in Upper Volta; (2) to present a conceptual framework designed for change agents to use in identifying key elements of the client society that affects the adoption of modern technology; (3) to elaborate upon the meanings of various elements outlined in the framework; and (4) to relate the framework to problems associated with the mechanization issue.

Some frustrating problems and controversial issues confronting change agents and farmer cultivators in Upper Volta interested in socio-economic growth were presented in this study. Le Organisme Régional de Développement du Koupela (Koupela ORD) was chosen as a region for illustration. Particular attention was focused on the appropriateness of the following alternative forms of tillage technology: hand tools, animal implements, walking tractors, and motorized equipment. It was concluded that more adaptive research is needed to design a mechanization program that is suitable to the indigenous factor endowment. It was also concluded that caution should be exercised in order to avoid the implementation of modern technology which would result in either the disintegration of the cultural environment without offering a viable replacement or a situation whereby cash income increased but development of the economic infrastructure did not follow.

It was pointed out, however, that there is a pressing need to begin now to enact specific development programs. There are questions

regarding what direction such efforts should take. It was suggested that greater use should be made of the village level change agent. He occupies a strategic position for obtaining vital information about the situation at the grass roots level. By relaying knowledge of the indigenous society to the planning authorities, the village level worker can narrow the "econocological gap" which separates theory from reality.

In order to provide the change agent with a greater awareness about how farmers might be expected to view proposals for technological change, a conceptual framework of the social ecology was presented. This framework is designed to facilitate the identification of key components of the indigenous society which affect the response of the client population to new technology. In the framework a distinction is made between the environment and the societal organism. The societal organism was defined as the dynamic component of society that is actually or potentially responsive to the environment.

In order to gain insight into the nature of the indigenous society, it was conceived that the societal organism could usefully be partitioned into three prismatic elements: culture, personality and the social system. Elaborations on the meaning of these prismatic elements were made. In particular, it was shown how the change agent could become more sensitive to the ways farmer cultivators perceive the environment by considering specific concepts related to culture, personality, and the social system. To illustrate the effectiveness of such an analytical approach the author drew upon his personal experience in describing situations in Upper Volta.

Finally, a skeletal strategy for gathering additional information on the nature of the indigenous society was suggested. A sample set of questions related to the environment and the societal organism were formulated to orient the change agent to the kind of information needed in evaluating alternative forms of mechanization programs in the Koupela O.R.D.

PREFACE

The objectives of this study are (1) to introduce the reader to tillage problems confronting the farmer cultivator in the cercles of Koupela, Tenkodogo, and Garango in Upper Volta; (2) to present a conceptual framework designed for change agents to use in identifying key elements of the client society that affects the adoption of modern technology; (3) to elaborate upon the meanings of various elements outlined in the framework; and (4) to relate the framework to problems associated with the mechanization issue.

In making assessments regarding feasible forms of technology, it is essential that consideration be given to local and national requirements. At the national level, the primary goal is to create what Mosher calls a "progressive rural structure" that is capable of generating increased production, income, and welfare (Mosher, 1969). Priorities have to be established on how to accomplish this goal of making agriculture progressive. Before choosing the kind of innovative development packages that should be promoted, the government must consider the impact that the particular program under review would have upon various sectors of the economy and the ramifications such impacts would have on long run development objectives.

On the micro scale of the village, it is important that whatever kind of modern technology is being diffused can be assimilated into the general farming pattern and result in more efficient utilization of resources. The development packages should be designed technically in such a way that the average cultivator can alter his customary technology

and adapt himself so as to be able to adopt the new techniques. Furthermore, the innovative packages which are chosen should suit the needs of the farmer cultivator as he himself perceives them.

It is important that development programs be designed to enable the objectives of the government's programs to mesh with the goals of the population of farmer cultivators. The national objectives usually are well articulated and understood. The goals of the farmer cultivators, however, are generally not. Hence, it is not surprising that programs promoting modern technology intended to alleviate poverty and foster development are frequently not adopted by the client population. More attention must be directed toward determining the felt needs of the farmer cultivators and discovering facts about the local community affecting socioeconomic growth relevant to these programs. It is important for change agents to be able to anticipate likely responses to proposed innovations so that appropriate programs can be formulated which influence the behavior of the client population in the desired direction.

Therefore, one of the primary objectives of this study is to present a conceptual framework from which change agents can determine the kind of information needed to gain insight about how action proposals are likely to be perceived by the client population. The framework emphasizes the importance of assessing the resource base of the environment, of obtaining information about the structural features of the social and cultural system, and of becoming aware of the attitudinal and cognitive patterns characteristic of the farmer cultivator population. Hopefully, it can be used as a guide that would enable the change agent

to systematize his thinking and increase his ability to articulate about the client society. When this is done, the change agent will be more effective in designing innovative programs and in implementing the right kind of modern technology that can ameliorate the condition of the average farmer cultivator.

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CHAPTER I

AN INTRODUCTION TO UPPER VOLTA

Frustrating Poverty in Koupela ORD Region in Upper Volta

The Republic of Upper Volta is a small land-locked country in the savanna region of West Africa, south of the Sahara Desert. Upper Volta is independent, having gained its freedom from colonial French rule in 1960. Since Le Plan Cadre of 1966, the Voltaic government has planned to amalgamate the forty-four political states called cercles formed during colonialization into ten regions known as Les Organismes Régionaux de Développement (O.R.D.) (Préault, 1920:9). As of the 23rd of November, 1968, the ORD du Centre-Est, referred to as the Koupela ORD, was established by decree no. 68/Agri-El. The Koupela ORD comprises the three cercles of Koupela, Tenkodogo, and Garange (Figure 1).

Having been a Peace Corps Volunteer working in this region from November 1967 until August 1970, I became interested in how the people of the Koupela ORD could improve their level of living. Ninety-five percent of the working population in Upper Volta secure their livelihood from farming. Yet the physical environment is severe and not endowed with features favorable to agriculture. The combination of poor soils and variations of rainfall make agriculture a risky occupation. In addition to the severe natural environment, the low level of technology and the cultural obstacles to change make future prospects for eluding the grips of subsistence agriculture rather dim.

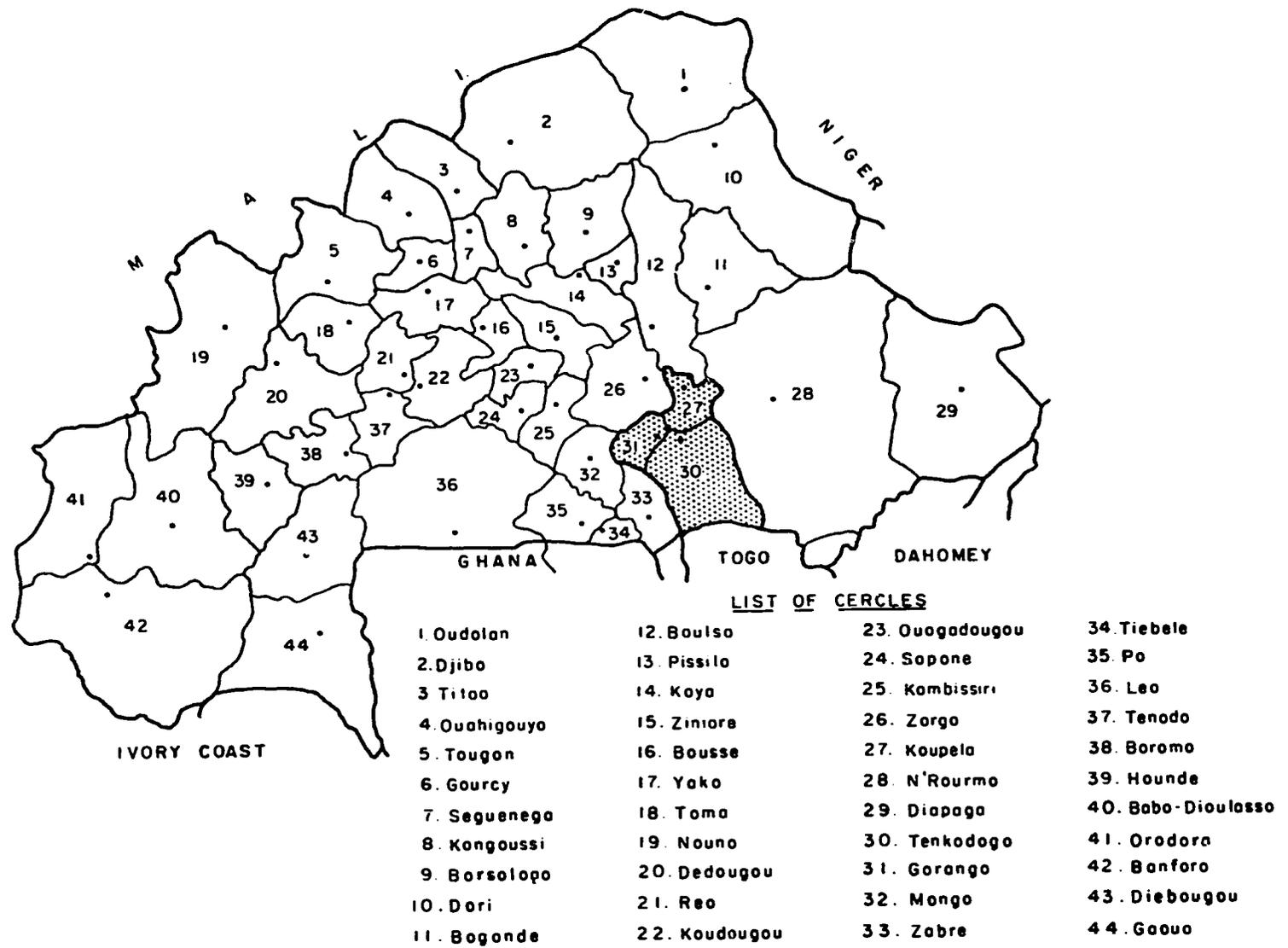


Figure 1. Upper Volta - Map of Cercles

Much of the land in the Koupela ORD is poor in quality. It has been estimated that over 50 percent of the cultivatable land is already over-exploited (Préault, 1970:19). In certain zones, the renewal of soil fertility on the peneplain that dominates the horizon is almost impossible. When the lateritic portions of the soil are exposed to the air, the land becomes hard and sterile for agricultural purposes.

The rainfall pattern varies from one year to the next. Thomas (1965:51), in an article entitled "The African Savanna Climate and Problems of Development," notes the characteristics of the monsoonal rains: "The season of rainfall may be short or long, may consist of steady rain or intermittent showers, may vary from year to year and even fail to materialize in dry years."¹

Outside of agriculture there are few if any alternative activities with which a Voltaic may render support to his family. One alternative is to migrate to large urban centers; such as Ouagadougou and Bobo-Dioulasso or to the coastal areas of Ghana and the Ivory Coast in search of employment. Usually it is the young and hardy who flee. In a few cases jobs are found and money is sent back home to the extended family.

¹In the cercle of Koupela in 1944 only 564.4 mm of rain fell in 40 days while in 1943 1099.9 mm were recorded in 62 days. In the cercle of Tenkodogo the minimum rainfall reported for one year occurred in 1939 when 612.8 mm was measured. The maximum rainfall recorded was in 1935 when there were 57 days of precipitation and 1542.6 mm of water was recorded (Préault, 1970:10-14). Rain varies considerably not only in amount but also in time. Normally rain begins to fall around the middle of May and continues until the end of September. In 1970 there was a departure from the general pattern. A drought took place at the outset of the rainy season. In Garango, one downfall occurred on May 25, the next fell almost a month later on June 17. It was not until July 5 that the rainfall pattern became regular.

But in general such migration is detrimental to the home community as the most productive segment of the farming labor force is lost and as the pressure for acquiring money and foreign consumer goods through innovation in local agricultural techniques is reduced (Hammond, 1966:37).

Another alternative is to become a governmental employee. Fifty years have passed since contact was made with the French. A consequence of this cross-cultural contact has been the emergence of a non-endemic class of citizens known as functionaries. The functionaries are civil servants, teachers, agricultural extension workers, soldiers, and political officials who perform services for the modern, as opposed to the traditional, sector. They are paid by the government. Becoming a functionary is a real alternative to only a few. The jobs are scarce. The competition is keen. The supply of qualified personnel exceeds the number of job openings. Without formal education, it is not possible to become a government employee. And very few Voltaic bush farmers have received any schooling.

A final possibility is to become a merchant. But here again this is a realistic possibility to only a few. There is the problem of a shortage of effective demand for market exchanged goods. Furthermore, it takes a large quantity of capital, which the Voltaic farmer does not have at his disposal, to set up a business which will be remunerative to the point that commercial activity may be substituted for farming. At present a few farmer cultivators engage in marginal market operations which complement, rather than substitute for, their farming activities.

Virtually all Voltaics, be they elite functionaries or farm cultivators, have a basic concern. This concern is to improve their level

of living as well as that of their fellow brothers. Contact with the affluent societies of the West has made Voltaics dissatisfied with aspects of the traditional way of life and more receptive and desirous of change.

Despite the contributions of modern civilization, science, and technology, the changes which have occurred have not always satisfied the anticipations of those seeking development. Frustration arises, for instance, when the farmer cultivator becomes aware that the amenities of modern civilization are so difficult to achieve. Farmers often do not realize the costs involved in buying modern equipment nor the costs to their culture in adopting new techniques. In some instances, therefore, promotion of modern technology which has not been adequately tested has resulted in expensive mistakes being made and discontinuance of the new techniques. According to deWilde, cases of past failures together with the general poverty of the habitat have bred "fatalism and distrust of innovation" (deWilde, 1967:I-18).

Frustration exists also for the village level agricultural extension agent. He can point to many cases where innovations have been added but have not been fully integrated into the farming pattern. As an example one may inspect the problems associated with promoting cotton as a cash crop in Upper Volta. The staple crops of millet and sorghum are of primary importance to the farmer cultivator no matter how high the price of cotton may be. Therefore, it is only after the traditional crops have been sown that a farmer will devote time, if in fact any time remains, to plant cotton. And then the recommended techniques associated with cotton growing; such as, planting in rows, using insecticides, and thinning out seedlings are not usually adopted at the same time.

There is cynicism regarding existing efforts to promote development that tends to breed apathy. When questioned why recommended techniques are not always adopted, both functionaries and farmer cultivators make the claim that the absence of financial and capital requirements are responsible for slow progress. A common phrase is "il manque la moyenne" (the means are not available). Upon being uttered, it is often accompanied by a fatalistic clap of the hands followed by a display of the palms. This gesture is indicative of frustrated desires.

The Controversy--Agriculture or Industry

There are divergent opinions, arising from the lack of knowledge about the total environment, as to how development is best achieved. There is little disagreement however as to whether concentration should first be made to develop the industrial sector or the agricultural sector. While many Voltaics, especially the functionaries, have visions of the existence of a manufacturing and processing plant complex, there is an understanding that to devote, at this stage, scarce resources to the creation of an industrial base would benefit only a small portion of population. Economist Stolpher would concur. Speaking about the traditional economies of Africa, he states: "The increase in output of the 'modern' sector is purchased by a decreased output in the 'subsistence' sector" (Stolpher, 1966:21). Furthermore it is questionable, if investment were concentrated in the industrial sector, whether growth would be generated. The structural mechanisms in the modern sector (banking, credit, transport facilities, and complementary industries), through which multiplier linkages flow, are nonexistent. Providing a few more

jobs in the cities could aggravate the already existing unemployment problem by adding momentum to the present "pull" to the large centers and the "push" from the farms.

The major concern for Upper Volta and other developing nations like her is to revitalize the agricultural sector. Emphasis should be placed upon expanding output and incomes by using new agricultural technologies which do not seriously disrupt the social system. Another emphasis of equal importance is that the agrarian system should be designed (as the new techniques are integrated into the general farming pattern) to provide more rural employment opportunities. Eicher et al. (1970:1) conclude that employment generation is an equally important development objective as growth in per capita income. In order for rural regeneration to take place both income and output as well as employment must increase.

The Static Nature of Indigenous Technology Hypothesis

There is much less agreement as to what should or even what can be done to promote development in the rural areas. The problems of transforming traditional agriculture are complex and interrelated. The solutions are not facile. The indigenous farming techniques have evolved over many years.

Schultz (1964:31) has remarked that traditional economies are "static but efficient." Yet, there is lack of agreement about the nature and degree of efficiency which exists in the Koupela ORD. Response varies depending upon one's position in society. The farmer cultivator's perspective is different than that of the change agent.

The farmer cultivator would place high value on certain activities which are only indirectly related to output. Thus, for instance, it might be in his best interest to devote a day attending a neighbor's funeral festival rather than to work in the field. At some later date the farmer could need a service that is more valuable than a day of labor which his neighbor can and will provide because of the reciprocal relationship established between them.

It is interesting to note however that the expert change agent whose criteria of efficiency are based upon activities related directly to output can rarely show a farmer cultivator how to substantially increase his yields. Given the resource constraints and given the fact that there are many uncontrollable factors; such as, disease and drought which affect the farmers' well-being, it is indeed a tribute to the Voltaic farmer that he has managed to subsist as well as he has.

It is easier to challenge the position that traditional economies are static than that they are efficient. Miracle (1967:286-287), who has conducted intensive studies on tribal economies, asserts that African agriculture is variable over time. He supports this position with evidence of technological change in the Congo Basin and concludes that total agricultural technological change has far exceeded what has been substantiated because much has never been recorded in the preliter-ate agricultural economies. Yet what technological change that has taken place has not been sufficient to raise productivity to levels which would prevent migration from the rural to the urban centers.

Transferability of Western Technology Hypothesis

The reasons are moot as to why past technological change, which has autonomously emerged from the indigenous setting, has not been sufficient to develop agriculture. Because of the absence of facts concerning tropical Africa, it is very difficult to determine appropriate technologies. Schultz (1964:84) argues that "in traditional agriculture the factors of production on which a community depends are expensive sources of economic growth." It follows from this line of thought that concentration should be placed upon nontraditional factors from the developed countries. Indeed, it does seem reasonable that the developing countries should reap benefits from the world's research and development expenditures, 95 percent of which takes place in the developed nations (Eicher et al., 1970:40).

It is argued that "short-cuts" to development can be taken if modern technology is assimilated into the economies of the developing countries. Bonné (1956:24) believes that assimilation or the "transferability of the major factors of production" is capable of "implanting development" in the Third World.² Yet, deWilde et al. (1967:I-157) in their book entitled, Experiences with Agricultural Development in Tropical Africa, suggests that "It can by no means always be taken for granted that there are available improvements which either singly or in combination will appeal to farmers as being both profitable and sensible in light of their sense of values and the constraints within which they must operate." Other scholars contend that the existing technologies

²According to Bonné, assimilation is replacing "the spontaneity of the economic process" which so characterized nineteenth century growth in America.

from the industrialized world are not easily transferable to the developing nations. Singer (1953:19-32) lists four reasons: (1) the initial expense of investment in modern technology is high; (2) the capital is too sophisticated to be manufactured in the developing nations and therefore must be imported; (3) investment in the developing countries is not as great as it should be because of the presence of labor saving rather than labor using elements in modern technology; and (4) the life of capital is much shorter in the developing world than in the industrialized world.

And Eicher et al. (1970:40) speak of the danger of a "technological trap" when there is indiscriminate adoption of Western technology. Largely due to "tied aid arrangements" which are often "subsidized by African governments" the African nations are becoming locked into the use of technology from the developed countries (particularly mechanical technology) that is not appropriate to their factor endowments.

CHAPTER II

MECHANIZATION: THE CASE OF PROPOSALS

There is a lack of agreement about the type of modern tillage technology which should be promoted in the Koupela ORD. There have been discussions concerning the appropriateness of the following forms of mechanization: hand tools, animal implements, walking tractors, and motorized equipment. Farmer cultivators and village level workers do not have corresponding views as to the best type of technology. Even trained experts (program designers and policy analysts) have not been able to make definite statements.

In this chapter, cases that have been advanced for alternative forms of mechanization will be presented. Opinions of scholars who have investigated the mechanization issue will be expressed. To substantiate some of these opinions, experiences gained in implementing mechanized projects elsewhere in Africa will be cited.

The Daba Technology

The indigenous technology in Upper Volta is primitive--power being derived from human labor and from the daba (a short-handled hoe). In many respects, the daba is well suited for savanna regions. It is versatile and easy to use for tilling land on rough topography, for inter-row cultivation, for sowing and for gardening. It stirs the soil on the peneplain without digging so deeply as to bring to the surface the lateritic subsoil dispersed over the terrain, which once exposed to oxygen, hardens and renders the land sterile.

The indigenous technology based upon the daba is well integrated into the traditional culture. Labor tasks are delegated to different members of the family depending upon sex, rank and age so that the society functions smoothly. According to Hammond (1966:209), a "delicate balance" of mutual independence exists between the native technology and the indigenous social system. Whether the traditional society could withstand change accompanied by the diffusion of new techniques is questionable for the adjustment mechanisms that mould elements alien to the indigenous culture are not well understood.

There are several disadvantages for relying completely upon the daba. Cultivation proves to be very arduous if the hoe is the only instrument by which a farmer extends his power. Labor and time constraints do not permit optimum tillage practices to be performed throughout the growth cycle. And the farmer is constrained by power limitations as to the amount of land he is able to manage.¹

The justification for introducing new forms of mechanization in the Koupele ORD is that it would break labor bottlenecks and it would improve the quality of agricultural operations through better land preparation before planting and more frequent weeding during the growth cycle.

Voltaic farmers consider labor to be the major limiting resource. Yet a great deal of economic literature has been devoted to the concept of redundant labor. It has been shown, however, that removing labor

¹Using traditional techniques, Stokes (1963) has found that in Northern Nigeria, farms vary between 2 and 12 acres depending upon the size of the family. But farmers possessing a plow, draught oxen, and a cart have farms ranging from 16 to 20 acres with an expansion potential to 50 acres.

from the agricultural sector has caused a decline in output. Proponents of the redundant labor hypothesis, according to Schultz (1964:58), "have failed to understand the most elementary basis of the seasonality of agriculture." And deWilde (1967:I-83) has pointed out that "Seasonal labor peaks tend to be particularly high in savanna areas where climatic factors, particularly rainfall, severely limit the cropping season and put a premium on the timeliness of agricultural operations."

It is understandable therefore why Voltaics consider labor shortages to be a major constraint. During the growing season from June until October most the peasants' waking hours are spent working in the fields to get sustenance for the coming year.

There are principally two critical constraints to which the power limitations of human labor and the daba may be attributed and to which capital additions may increase productivity. The first concerns proper preparation of the fields for planting and the second deals with weeding throughout the course of the growing season. There is no doubt that the adoption of improved tillage equipment has a potential for improving the quality and quantity of land preparation and weeding operations. It should enable such operations to be performed on time and on a more regular basis. Furthermore, it could permit more land to come under cultivation.

A primary advantage of proper preparation of the fields before sowing is that the water holding capacity of the soil is increased. The crops are therefore better able to withstand periods of drought which frequently plague the farmer. Further, seed which has been planted immediately after the first rains is more likely to germinate if fields

are prepared correctly. This eliminates the burdensome task of reseeded three to four times. In addition, land preparation permits deeper root penetration and greater control over weeds. And finally, deep tillage of certain kinds of soil such as vertisols and halomorphes, would release rich elements that are not being exploited under the traditional technology as well as improve the cation exchange capacity (Préault, 1970: 15-18).

The advantages of weeding are well known to the Voltaic farmer. When fields are not properly tended, it is usually due to competing activities which prevent a farmer from weeding on time. But delay of weeding diminishes yields substantially. "Tests on the research stations have demonstrated that a delay of two or three weeks in the first weeding (of cotton) could reduce the yield between 30% and 35%, and that a delay of six weeks could bring about a fall in output of 60%" (deWilde, 1967: I-323).

There is general recognition that new, improved tools are needed to complement the daba. But there is no consensus as to what kind of equipment would be appropriate. Some individuals, in a hurry to get agriculture going, advocate the employment of motorized tractors. By using such sophisticated equipment some time and labor bottlenecks are assured of being mitigated. The tasks of cultivation can be performed quickly, enabling target periods--critical planting and weeding dates--to be met. This would result in better crop growth. Others contend that it would be better to diffuse a system of animal traction before embarking upon a program of tractor motorization. Certainly a good case can be made for progressing in a steady stepwise fashion without skipping

stages. The government of Tanzania, for instance, reversed an earlier decision of actively encouraging engine-powered mechanization to one of limited use of tractors and to the promotion of oxen cultivation (Kline et al., 1969:II-87).

Animal Traction Technology

One alternative is the use of animal traction. In speaking of animal technology in Ghana, Kline et al. conclude that the area with the greatest potential for agricultural mechanization is the northern area of Ghana. He considers that this area also extends into southern Upper Volta where the land is flat and the rainfall pattern sufficient for producing most tropical annual crops (Kline et al., 1969:II-360). And Pr eault (1970:21) in a study of the Koupela ORD, assesses the potential value of a diffused animal (donkey and oxen) technology:

Regular use of animal traction would render the farmer less vulnerable to fluctuations in rainfall, which, at the moment, very often paralyze every new initiative. . . . Thanks to animal traction, the peasant cultivator will be better able to respect the agricultural calendar--performing on time such operations as plowing, weeding, and mounting.

Proper preparation of the land and correct timing of plowing, weeding and mounding are of extreme importance in alleviating the critical moisture supply bottlenecks plaguing the farmer.² Pr eault (1970:121) concludes by saying, "Eventually it (animal traction technology) will permit the expansion of cultivated surfaces."

²The inventor of the houe Manga cultivator is Father Chaix. In an interview with Walter Gutterbock and the writer at the Catholic Mission, Saba, Upper Volta in July, 1970, he asserted that "one dressing is worth two waterings." Father Chaix has obtained impressive results by preparing the soil before seeding and by timely weeding and mounting.

In summary, the diffusion of animal traction technology could increase agricultural yields through intensification of production and it could increase output through intensification of production by expanding the area under cultivation. Evaluating the role of animal power, the special task force at Michigan State University studying agricultural mechanization in tropical Africa concluded: "Far from diminishing in importance, animal draft is likely to remain a major source of power for the emerging African farmer for the remainder of this century" (Kline et al., 1969:II-355).

The widespread use of animal technology in the Koupela ORD would completely transform traditional agriculture. At present farmers in this region do not care for cattle, although donkeys are sheltered on the homestead. The oxen, which the cultivators own, are conveyed to the Fulani tribe and are considered a store of wealth. But the use of draft animals for plowing, weeding, and mounding would mean that livestock would be integrated into the farming pattern. Agricultural activities would be more diversified, permitting the growth of more cash crops, the cultivation of fodder, and the use of manure on fields. Some other changes accompanying the integration of livestock into the farming system would be improved crop rotation, replenishment of the soil because of animal droppings, adoption of new transporting, seeding, and harvesting techniques, and the diversification of consumption with increased milk and meat. And perhaps the greatest benefit to the introduction of animal technology would be the concomitant educational impact. Mechanization is an important teaching device permitting alterations in forms of cultivation.

There are a number of arguments which favor the introduction of animal technology over other more sophisticated forms of mechanization. One major advantage for animals is that there is low costs in terms of foreign exchange relative to that for tractors. Animals are available locally. Plows and cultivators, while imported, are assembled in the nation capital, Ouagoudougou, and entail a minimum amount of foreign exchange absorption. The Upper Voltan government is concerned about stretching its foreign exchange as far as is possible. By concentrating on animal rather than tractor technology, the national goals are better meshed into the local development plans.

Another advantage of animal technology is that it is more adaptable to the financial means of the individual farmer than is tractor technology. The cost to the farmer cultivator for a complete set of durable plowing implements would be 15,000 CFA (250 CFA \cong \$1). A pair of oxen costs 20,000 to 30,000 CFA. And a pair of donkeys costs 5000 to 6000 CFA. Because of the price differential between donkeys and oxen and because of the absence of a local credit bureau, donkeys are currently being promoted by the agricultural service in the Koupela ORD. Yet it is questionable whether donkeys have sufficient power to cultivate the heavy black soils on which cotton and rice grow. And cultivation is especially advantageous for increasing yields of these two cash crops.

Assuming that capital and credit were not limiting factors-- which is indeed not the case--there are other factors, both human and technical in nature, which could inhibit successful diffusion of animal technology. Voltaic farmers do not have a livestock tradition.

Adoption would require a revolution of thinking and habits. There are, for instance, kinship loyalty, land use patterns, division of labor, and other socioeconomic factors which tend to maintain the traditional technology. Furthermore, once symbolic adoption (the decision that the innovation should be tried) was made, it would take a long time before knowledge of how to use and care for cattle would become commonplace. A great deal of individual attention would be required to teach the farmer cultivator the fundamentals of cattle farming.³

Another problem area concerns feed for cattle. The problem is especially severe during the dry season and at the beginning of the wet season when work begins. There is the management question of how to gather and store fodder. But of critical importance is the land shortage. The Koupela ORD is one of the most dense regions in Upper Volta-- 42 inhabitants per km² (Préault, 1970:22). The bush circumscribing the civilized areas is heavily infested with *Simulium Dimonsum* vector--a black river fly which is a parasite that causes a disease called onchocerciasis and blindness in man. It is therefore dangerous to expand the area of cultivation beyond the existing frontiers. And the present land area is hardly sufficient to satisfy the needs of the human population.⁴

³According to deWilde (1967:I-283) it takes more than three years for farmers to learn how to satisfactorily use animal implements.

⁴As a matter of interest, Préault (1970:24) attributes a major cause of migration out of the region to the shortage of cultivatable land and to growing impoverishment of the harvests.

There is even some question as to whether the size of some landholdings per farm is large enough to justify the expenditure of a pair of oxen. Perhaps the use of donkeys, despite their power limitation, would be more appropriate. In the Koupela ORD farms range from 3.5 to 5.0 hectares, corresponding to the size of the family⁵ (Préault, 1970: 26-27). And according to the results of the animal traction scheme in Garu, Upper Ghana (an area adjacent to the Koupela ORD), it is estimated that to justify a pair of oxen, a farmer should have between 4 and 6 hectares of crop land (Kline *et al.*, 1969:II-84).

In delineating other problem areas, it may be useful to anticipate difficulties by reviewing obstacles experienced elsewhere. It was reported in a 1963 study in Maswa, Tanzania, for instance, that a major labor constraint in using hand implements was primary cultivation before sowing. The introduction of ox cultivation solved this problem in Maswa. However, few significant benefits accrued to the farmer because of the emergence of a weeding bottleneck (Collinson, 1964:38). In introducing animal traction in the Koupela ORD attention should therefore be focused not on either plowing or weeding but on how the quality and rapidity of both operations can be improved. The selection of appropriate plows should take such technical considerations into account as the ability of the plow to effectively destroy weeds in land preparation and the versatility of the plow to perform weeding and related operations such as ridging and mounding.

⁵One adult cultivates, on the average, one hectare of land.

There was an effort to promote the use of a cultivator called the houe Manga, over an area covering 50,000 square miles around Ouagagoudou and Koudougou, Upper Volta (deWilde, 1967:II-369, 380). The houe Manga is a light weight multi-purpose cultivator with exchangeable teeth that was designed especially to meet the needs of the peasant farmer in Upper Volta. It can be drawn by a single ass in light soils and for the Voltaic farmer who has relative greater access to donkeys than oxen, this is a major advantage. However, for those farmers who have stronger animals, oxen or horses, or more than one donkey, the houe Manga can become an even better implement for plowing and weeding.

The program to promote the sale of the houe Manga was initiated by a French development agency, Société d'aide technique et de coopération (SATEC), in 1961. But due to the many problems encountered, not the least of which were difficulties in inculcating within the peasants the necessary skills and motivations to operate the cultivator efficiently, the program was terminated in 1964. "Because of the SATEC experience," said the inventor of the cultivator, Father Chaix, "the government no longer takes the houe Manga seriously"--despite the fact that it was designed specifically to meet the local factor endowment.

It is possible that the sale and use of the houe Manga should not be discouraged in the Koupela ORD. Certain modifications in either the technical design and/or in the method of promotion may be in order. In reassessing the feasibility of this instrument, it would be instructive to inspect the explanations given by the people in the area of Koudougou for the mediocre response to this innovation and to try to seek solutions for the problems cited. One should keep in mind the fact that

explanations for the failure will differ depending upon who is interviewed. Perception varies according to the perspectives from which the situation is seen.

It is no doubt due to the existence of unsolved issues that Pr eault (1970:21), despite optimistic remarks concerning the grand potential for diffusing animal technology, concludes with the following statement: "This technical theme, important as it is for the development of the region will only be able to propagate itself progressively.

Motorized Tractor Technology

A possible alternative to the use of animal traction is motorized tractors. At present, there are three large tractors in the Koupele ORD region. One is owned and operated by the Catholic Mission in Dialgaye and the other two are owned by two merchants who rent the use of the tractor for 1100 CFA an hour. The interest in this form of mechanization is evident. Women do not hesitate to pay 250 CFA for a tractor to plow their fields of 15 to 25 ares. The opinion regarding the work done is unanimous: "The crops grow better on land cultivated by the tractor and the weeds grow less quickly" (Pr eault, 1970:84). Pr eault (1970:84) asserts that "the fact that merchants are beginning to invest in this type of equipment proves that the work performed corresponds to a felt need of the population."

A major attraction to the employment of tractors is the technical efficiency it provides to primary tillage operations. Eicher et al. (1969:22) concede: "The fact that rainfall patterns and soil conditions permit only a few days between plowing and sowing in a number of African

countries might warrant subsidized mechanization. . . ." And indeed, when farmers in the Koupela ORD were asked if the animal drawn plows would not have the same effect on increasing crop yields as motorized tractors, Préault (1970:84) found the typical response to be, "the effects are the same, but the animals do not work fast enough to prepare all fields in order to sow on time."

Another attraction to the promotion of motorized traction is the "psychological stimulus" it provides in institutionalizing the idea of change within the thinking horizon of the peasant farmer. It is for this very reason that the decision was made to introduce tractors on the traditional setting of Grimari in the Central African Republic (Morel et al., 1964). The designers of the tractor program recognized that theoretically the classical approach of introducing intermediate animal technology could substantially increase the farmers' yields. However, they noted that the typical farmer in Grimari associated "modernization with motorization." Because of the lack of enthusiasm regarding animal traction, there were serious misgivings about promoting this kind of technology. The program designers decided, therefore, to implement a program of motorized tractors. The results of this program are impressive.⁶

⁶The Grimari tractor program began on a small scale in 1956 with only fourteen mechanized families. A total of eleven hectares were plowed in fifty-five hours and seven hectares weeded in fourteen hours. The project expanded quickly because the human response was positive. In 1962, 231 families were mechanized. They plowed 124 hectares in 872 hours and weeded 82 hectares in 186 hours (Morel et al., 1964:24, 28). On the average those villagers who participated in the program received a net revenue of 172 percent of that received by their counterparts, the tradition farmer (Morel, et al., 1964:37). Those farmers who followed

The success at Grimari is an exception rather than the rule. The records are replete with motorized tractor schemes which have failed in West Africa. In assessing the viability of tractor programs it is necessary that the analysis take into account the feasibility of such schemes from the individual farmer's financial position as well as from the perspective of the national economy.

There are a number of reasons that many tractor schemes have not proved profitable from the farmer's point of view. A major problem is underutilization of expensive machinery. Kline *et al.* (1969:II-376) suggest a solution: "The first task is to find more useful work for each machine and to reduce unit overhead costs. The second is to reduce non-productive work and wasteful operating. . . . Much more emphasis must be put on multiple cropping and on diversification of operational tasks to fully utilize productive machinery."

Frequently, the buyer of a tractor will consider only the initial cost and neglect additional costs of repair and depreciation. The problem of maintenance is an especially severe one in areas such as the Koupela ORD where no infrastructure exists to deal with ordering of parts and repairing of materiel. The comparatively high maintenance costs could diminish with time. As farm managers, mechanics, and drivers of tractors acquire improved skills, returns would increase. Operating costs would decrease as economies of scale were realized. And repair facilities would be built to accommodate increasing demand.

the Grimari recommended crop surface system increased their revenue 372 percent of that of the average traditional family (Morel *et al.*, 1964: 38). And officials at the Grimari Station envision instead of a three-fold increase in production, a potential tenfold increase in the future to be within the realm of possibilities.

Land must be free of rocks, trees, stumps, and roots before tractors can be used. If land is not cleared properly, excessive breakage of equipment will occur. Using the daba technology, the farmer in the Koupele ORD often cultivates around difficult areas rather than engage in the painstaking task of completely cleaning the fields. The cost of mechanical clearing is excessively high. A possible way of circumventing this cost is to require the farmers to clear their own fields. An additional advantage in laying the burden of land clearance on the farmer is to emphasize the idea that mechanization is not designed to lighten the work load of the farmer but rather to enable him to work more productively.

In deciding upon the merits of tractor mechanization attention should be focused not only upon the financial profitability in regards to the individual farmer but also upon the economic impact that such a program would have on the national and local economies.⁷ Eicher et al. (1970:22) point out that "tractor mechanization projects are usually appraised on a technical or financial basis rather than an economic or national basis." And Shaw (1970:40) contends that the distinction between private returns and returns to society has not always been made. "The private returns are calculated in terms of the prevailing market prices for inputs and outputs. They make no allowance for overvalued foreign exchange, undervalued interest rates, government subsidies, the cost of resettling and employing displaced workers,

⁷It is important to avoid failures such as occurred in Northern and Upper Regions of Ghana where in 1968, 168 of 907 motorized units were classified as unserviceable (Kline et al., 1969:II-388).

and other related costs and benefits that are included in social returns. The key danger in introducing motorized equipment, according to Shaw, is that it could foster polarization--enabling the rich to get richer and the poor to get poorer. And in the study of the Koupela ORD, Préault (1970:85) concludes: "The mechanized areas perhaps will increase in the future, but it will not touch the majority of the peasants. Only animal traction, oxen and donkey, can augment the value of the work done by the small farmers."

Walking Tractor Technology

There is, however, another possible alternative for moving from muscle power to engine power besides animal technology; that is, by using small walking tractors. In Kenya, a walking tractor called the British Landmaster 150 has undergone tests to ascertain its ability to work as a rotary cultivator (Kline *et al.*, 1969:II-395). The performance and durability of this machine has proved satisfactory. It is considered suitable to deal with conditions in East Africa.

Early in 1970, the Ford Motor Company began marketing a seven-horsepower walking tractor with a transaxle system which transmits power directly to a pair of cast-iron wheels. This machine is called the Ford DNT tractor, with DNT standing for "developing nations tractor." According to the Ford officials, the DNT is superior to the Landmaster because it is more versatile. The Landmaster was designed for "garden conditions." "The DNT is an all purpose agricultural machine for the small subsistence farmer of the developing world . . . designed for those tough, unsophisticated conditions" (Ford Motor Company, 1972).

It has a single-bottom moldboard plow and will till as deep as six inches in most soils, including the tough clays found in many tropical countries. It contains no belts or pulleys to break or to reduce effective power output. It was designed to perform slightly better than a pair of oxen, being most efficient and easier to operate (Parsons, 1970).

The basic DNT tractor has been marketed in Jamaica, Peru, and Ecuador at a retail price of about \$560 (Ford Motor Company, 1972). To the base figure of \$560, one should add the cost of purchasing the additional attachments, \$160, and the costs of repairs and services. Despite the fact Ford claims to have cut its profit margin to the minimum expecting high volume sales, the DNT is relatively expensive for the average Voltaic farmer whose yearly income is \$50.

However, the costs of a pilot scheme to test the adaptability of both the Landmaster 150 and the Ford DNT to the conditions in the Koupela ORD would not be expensive and might bring handsome dividends. The small walking tractors could prove to be a better substitute for the indigenous technology than animal technology, in which case diffusion of walking tractor technology on a large scale could be justified. In this event, many of the issues associated with integrating livestock into the traditional farming pattern would not arise. Following pilot trials, the small walking tractors might, on the other hand, prove to be feasible for only specialized operations. But should the planning authorities decide that it would be in the national interest to embark upon a program of "selective" mechanization, the walking tractors could be promoted on a limited basis to those areas where it would be viable.

Concluding Remarks

Before launching a widespread campaign for introducing any particular form of mechanization in the Koupela ORD investigations should be made to pinpoint specific problems and requirements of the region. The exuberance to engage in development by implementing sophisticated technology from the developed countries should be tempered with prudence. Once a decision has been made to promote new technology, precedence is established which may affect the success or failure of future developmental endeavors. It is important, therefore, to engage in adaptive research in order to avoid being caught in the "technological trap" of promoting innovations not suitable to the factor endowment.

CHAPTER III

THE ROLE OF THE CHANGE AGENT

In the Koupela ORD it is expedient to confront a number of development problems at the same time. Therefore, as fact finding research is being conducted, it is important to devote attention simultaneously to the implementation of "modern technology,"¹ to the critical evaluation of existing development efforts, and to the formulation of more efficient strategies for the generation of socioeconomic growth. Indeed, a corps of professionally trained individuals have emerged in the Koupela ORD who are addressing themselves to these issues. They include (1) policy analysts, (2) program designers, and (3) village level workers. These individuals, known as change agents, are interested in modifying traditional patterns of behavior and directing change by influencing adoption decisions in the desired manner. These change agents have altered tradition in their efforts to instigate regeneration of the rural sector. Change is becoming conspicuous, whereas before independence in 1960, it was hardly perceptible.

Ostensibly, the changes being promoted by professional change agents results in improvement of the level of living of the farmer cultivators. This may not necessarily be the case however. Impingement upon the indigenous way of life could have undesirable effects.

¹Modern technology" refers to whatever techniques are new to the farmer cultivator population.

According to ethnographic studies conducted by Dalton (1971:96-104), three kinds of situations have occurred: (1) degenerative change, (2) growth without development, and (3) socioeconomic development.

The Effects of Outside Incursion

Degenerative Change

Degenerative change takes place when there is disruption of conventional life to such a severe extent that the traditional institutions, designed to deal with stress and conflict, are overwhelmed by outside forces. Dalton notes that the principle cause of degenerative change has not been economic exploitation but rather disintegration of the cultural environment.

Because of the possibility that change will be degenerative, change agents should be aware of the potential deleterious effects that may result from introducing new technologies. Of course any time that innovative changes are introduced, there will be some disruption of the traditional way of doing things. Over the course of future events, the self-contained feature of traditional village life is bound to lose its purity. The fact that alterations of tradition occur is not in-and-of-itself important, however. What is of utmost significance is whether the transformations which do result merely break the traditional circuit without offering any replacement or whether the transformations proceed far enough to give the farmer cultivators an alternative life style.

Growth Without Development

According to Dalton the situation of growth without development originates from an untraumatic external incursion which allows ordinary

activities, such as ceremonies and social relationships, to continue much as before. It is characterized by an enlargement of cash earning activities with no concomitant adoption of improved technology. Cash income growth without development is manifest in the Koupela ORD when farmers do not use the money gained by selling such cash crops as cotton, peanuts, onions, and mangoes to buy capital goods that would generate income and output. Farmers frequently spend their money to satisfy old status prerogatives (like increasing expenditures on ceremonial activities) or to deal with new conflict situations (such as lending money to a kinsman in need).

Socioeconomic Growth

The third case involves socioeconomic growth. In the process of modernization, new and old institutional characteristics co-exist side-by-side. Anthropologists often view successful development as minimizing social and cultural costs. Economists, on the other hand, usually view successful development by employing impersonal indicators such as gross national product, per capita income, and use of advanced technology. Both views should be compatible if socioeconomic growth is truly taking place.

The Policy Analyst

In Upper Volta there is a cadre of planning officials formulating policy and coordinating programs in Ouagadougou, the capital city. Many of these individuals have received formal training abroad. Some have gained expertise in the area of economics. The attractiveness of specializing in economics is the knowledge gained in learning how to

manipulate information with detached logic and theoretical rigor. Some insight about the nature of society and the potentiality for socio-economic growth can be gained by calculating and comparing data that measures such indices as the amount of disposable goods and services, factor mobility, technical absorption capacities, and the extent of capital accumulation.

Many policy analysts tend to rely quite heavily upon economic analysis as a basis for making decisions. Yet, sometimes the economic indicators used to gauge performance are too detached from the "real world" to be of practical value. They may not adequately measure the social and cultural factors which greatly affect change. In addition they may lack preciseness because of the absence of data. Furthermore, these economic indicators often embody preconceptions about the nature of society that reflect the origin of economics in the developed world.

Traditional economic theory provides the foundation from which many indicators are derived. As economic theory evolved from a relative homogeneous setting in the West, the assumptions behind this theory characterize the developed countries better than the less developed nations. Moreover, the very complexity of the theoretical constructs in economics tends to camouflage these assumptions. It is, therefore, easy to overlook the cultural bias embedded in conventional economic indicators.

For instance, the use of marginal analysis for examining the market mechanism or the means for allocating resources is a basic technique in economic theory. The relevance of this technique, in its usual profit-maximizing form, depends upon the extent to which the

economy is monetized and the extent to which income gains are of central concern. But the Voltaic price system is not yet developed to the point that it is possible to allocate goods and services with precision. The assumption made in Western economies that fluctuations in market prices will reflect fluctuations in demand and supply does not hold true in Upper Volta.

Furthermore, in addition to the market system, indigenous allocative mechanisms are still operating. As the Bohannans (1968:227-239) have suggested, many specific commodities in the savanna regions of West Africa, are transferred not by the market but through subsistence, kinship, and prestige "spheres of exchange." The Voltaic farmer places higher value on insuring subsistence, safeguarding important kinship relationships, and displaying prestige than on maximizing profits and minimizing costs in exchanging goods and services. For example, take the case of the farmer who requests financial assistance from a kinsman in order to engage in a socially acceptable endeavor, such as making a dowry payment to the parents of the girl he intends to marry. Should the farmer's kinsman have money readily available that is not earmarked for other purposes, he shall honor the request because of the higher moral significance attached to maintaining kinship patterns over maximizing income.² This example illustrates the fact that the price system is not the only mechanism which determines how the farmer disposes of his time and income.

²The use of this example does not mean to imply that tradition should be considered sacrosanct. The fact that institutional change often must be deep and far-reaching in order for socioeconomic growth to take place is not being reputed.

The lack of concordance between economics and reality is made apparent when planning economists cannot give adequate explanations for why adoption of innovations, which appear to contain desirable features, are not made. McHale (1962:30-36) refers to the ground between economic theory and the social ecology as the "econocological gap." He suggests that more attention should be directed towards relating the economizing activities to the specific socioecological context within which they take place. When this is done, "The causes of differential growth rates can be established, and basic problems of modern economic development which are usually ignored in conventional economic analysis can be identified."

One way to bridge the econocological gap is to gain relevant information about the nature of the social ecology by using economic indicators concerning income and poverty as well as by employing social indicators that deal with such aspects of the quality of life as health and illness; social mobility; physical environment; public order and safety; learning, science, and art; and participation and alienation.³ Specialists who have received training in various social science disciplines may develop statistics related to these social indicators which can assist the planning economists in determining the reasons for human

³In response to a request by President Johnson in March 1966 to develop a set of social indicators capable of measuring social change and useful in establishing social goals, Secretary of Health, Education, and Welfare, Wilbur Cohen, submitted a report entitled Toward A Social Report on January 11, 1969, which contained the social and economic yardsticks mentioned in the text above.

behavior in establishing a set of priorities, and in evaluating development programs.

However, just as economics is circumscribed by its tenets, these other disciplines are confined by their fundamental doctrines. For example, the parochial interests of sociology are revealed when non-adoption of an innovation is attributed entirely to social relationships. The notion--conformity to the social pattern determines behavior--is restrictive in the sense that it does not allow for the process of choosing between alternative courses of action to which economics addresses itself. And in anthropology, there is a tendency to dwell upon describing previous life and work styles rather than emphasizing techniques by which future responses might be predicted.

The various academic disciplines have emerged through the process of abstracting from specific instances and categorizing ideas into classificatory systems that yield different conceptual ways of looking at events. Thinking patterns gradually become institutionalized. It should be noted, however, that a certain degree of disciplinary bias has crept into the structures of most academic studies.

Despite the shortcomings of academic concepts, they possess analytical usefulness, facilitating comprehension of complex interrelationships. In analyzing the process of development, policy analysts should make use of the guiding relationships that have emerged from the various disciplines. By focusing attention across the disciplinary conceptual range, the interrelationships of academic principles become better understood. They can be checked and balanced against each other for relevancy and can be modified. And by taking a multidisciplinary approach in the analysis

of problems and formulation of development programs, the erroneous preconceptions about the social ecology become apparent.

The Program Designer

It is very important to avoid implementing programs that result in costly mistakes in Upper Volta where resources are especially scarce. The program designer, who is responsible for program content, needs to have a good understanding of the rural community in order to design projects which induce growth. When basic knowledge concerning the characteristics of society and the idiosyncrasies of its members are not known, it is difficult to evaluate development strategies and to make the necessary assessments about alternative programs.

The program designer is often removed from the local scene because of primitive communication and transportation networks and time consuming occupational tasks. It becomes difficult for him to know what is happening in the field and as a consequence, he sometimes overlooks the extent to which tradition inhibits the acceptance of projects that appear to be viable. He may not understand the ways in which adoption of new technologies cause basic changes in life styles. Furthermore, the program designer is often unaware of felt needs, preferences, and aspirations of the small farmer cultivator. He does not know how the target population perceives the constraints and the payoffs associated with specific projects.

Improved informational flows from the village level to the planning level are needed if development programs are to be effective. Program designers require reliable information to formulate and coordinate

projects which are suited to local conditions, which satisfy the felt needs of the farmer cultivator, and which meet the developmental objectives of the government.

The Village Level Worker

The risks of committing mistakes may be reduced and the chances of making the right kind of decisions may be enhanced through better use of the village level worker. The village level worker occupies a crucial position. He is a liaison between the farmers who are his clients and the program designers who are his patrons.

The village level worker is often able to identify what might be done to alleviate problems which the farmer cultivator does not perceive. At the same time, however, he may misinterpret events. Not being native to the region in which he works, the village level worker finds himself, from time-to-time, in situations which will require him to do more thinking. Familiar guideposts that permit acting and assessing without much reflection are not present. Some of the misunderstanding that takes place can be alleviated by just being aware of the danger of misinterpretation. Any deeper insight into the nature of the client population can be obtained by establishing communication and developing rapport with farmer cultivators.

It may appear that the single concern of the village level worker is to follow directives dictated by the policy analysts and to implement programs developed by the program designer. However, the principle concern of the village level worker should be to promote communication. He should relay the felt needs and requirements of the farmer cultivators

to the planning authorities; transmit messages made by the planning authorities to the client population; and seek feedback information from each of these two groups relative to the actions of the other. In summary, schematic form, the village level worker should facilitate a two, two-way flow of communication as shown in Figure 2.

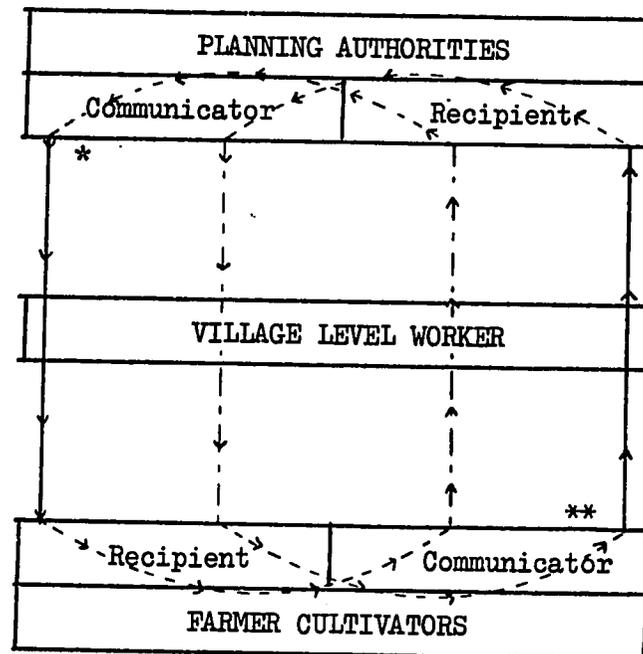


Figure 2. Two, two-way flow of communication.

- Key:
1. —→ the initial message.
 2. - - → the feedback message.
 3. * origin of the first two-way flow of communication
 4. ** origin of the second two-way flow of communication.

The first two-way communication flow originates with an initial message from the planning authorities to the farmer cultivator population and back to the planning authorities with a feedback message by the farmer cultivators. The second two-way flow of communication originates with an initial message from the farmer cultivators to the planning authorities and back to the farmer cultivators from the planning authorities with a feedback message.

Greater use should be made of the village level worker in formulating rural development programs. Due to his intimate day-to-day contact with farmer cultivators, he is situated strategically to gather important information and to make key judgments about the local community which should be used by the designer in making programs.⁴ An effective village change agent, for instance, can make relatively accurate evaluations concerning the capabilities and motivations of individual farmers. Furthermore, being knowledgeable of official objectives, he can help make key decisions about what measures need to be taken in either inducing or imposing adoption of desired technology by the client population.

In promoting socioeconomic growth, the change agent might pay heed to the following assertion made by Dalton (1971:104):

The point surely is to work with those powerful levers of new achievement which the people themselves perceive as desirable and which induce other positive changes. . . . If such developmental achievements are in fact incorporated, features of the traditional culture and social organization that are incompatible with the new are sloughed off without the personal and

⁴The information gathered by the village level worker should also be used by the policy analyst. There is a propensity, however, for policy directives to flow downward. Furthermore, there is the difficulty of condensing material assembled at the local level in such a way that it can be used by the policy analysts.

community malaise that characterize dengerative change and growth without development.

The village level worker can determine where the farmer considers himself to be on the continuum of acceptable alternative life styles. At one end of the continuum is the best possible conceivable state. At the other is the situation which is untenable. Perhaps one of the best ways that the village level worker can improve the quality of life is to encourage farmers to raise their aspirations and to give them support in making decisions. The farmer cultivators themselves must sustain socioeconomic development. The village level worker can only be instrumental in initiating growth by releasing the creative potential within the ranks of the client population.

The contribution the village change agent can make in discovering facts about the local community and conveying these facts to the designers of rural programs should be more fully appreciated and developed. One reason why the kind of information needed about the local community relevant for developmental purposes is often not considered is that the planners do not feel it is particularly significant. Another reason is that even when the village level worker has knowledge which he believes is pertinent, there is the difficulty in arranging it into a meaningful fashion that permits articulation to his patrons.

An overview from which the client society may be examined by policy analysts, program designers, and village level workers is needed. Such an overview is presented in the next chapter where key elements of the indigenous society are identified and blended together into a cohesive conceptual framework. Hopefully this framework will facilitate a systematic evaluation of important features of the social ecology at the

grass roots level which the change agent should take into account in implementing programs that involve innovative technology.

CHAPTER IV

AN OVERVIEW OF THE SOCIAL ECOLOGY

There is a low level of differentiation of society into component parts useful for analysis of development issues. The indigenous farmer does little compartmentalizing of society because he views elements of his surroundings as being inextricably connected together. The village level worker, being an outsider in close contact with the local community, is in a position to be more objective. He could obtain valuable information about factors stimulating and retarding growth. But he is not acquainted with academic terminology that would enable him to sharpen his thinking and to communicate more effectively with the designers and administrators of agricultural programs.

In differentiating between components of society it is useful to employ the term "social ecology." The concept of ecology is borrowed from biology where it means the study of relations between individual organisms and environment (autecology) and/or the study of relations between groups and environment (synecology) (Gould, 1964:215). The adjective social is used as a modifier of the noun ecology in order to emphasize the social rather than the physical aspect of the term ecology.

A conceptual framework of the social ecology, like that illustrated in Figure 3, might aid policy analysts, program designers, and village level workers to identify key elements about the client society of farmer cultivators that affect development. It may be useful in diagnosing the likely responses of individual farmer cultivators to

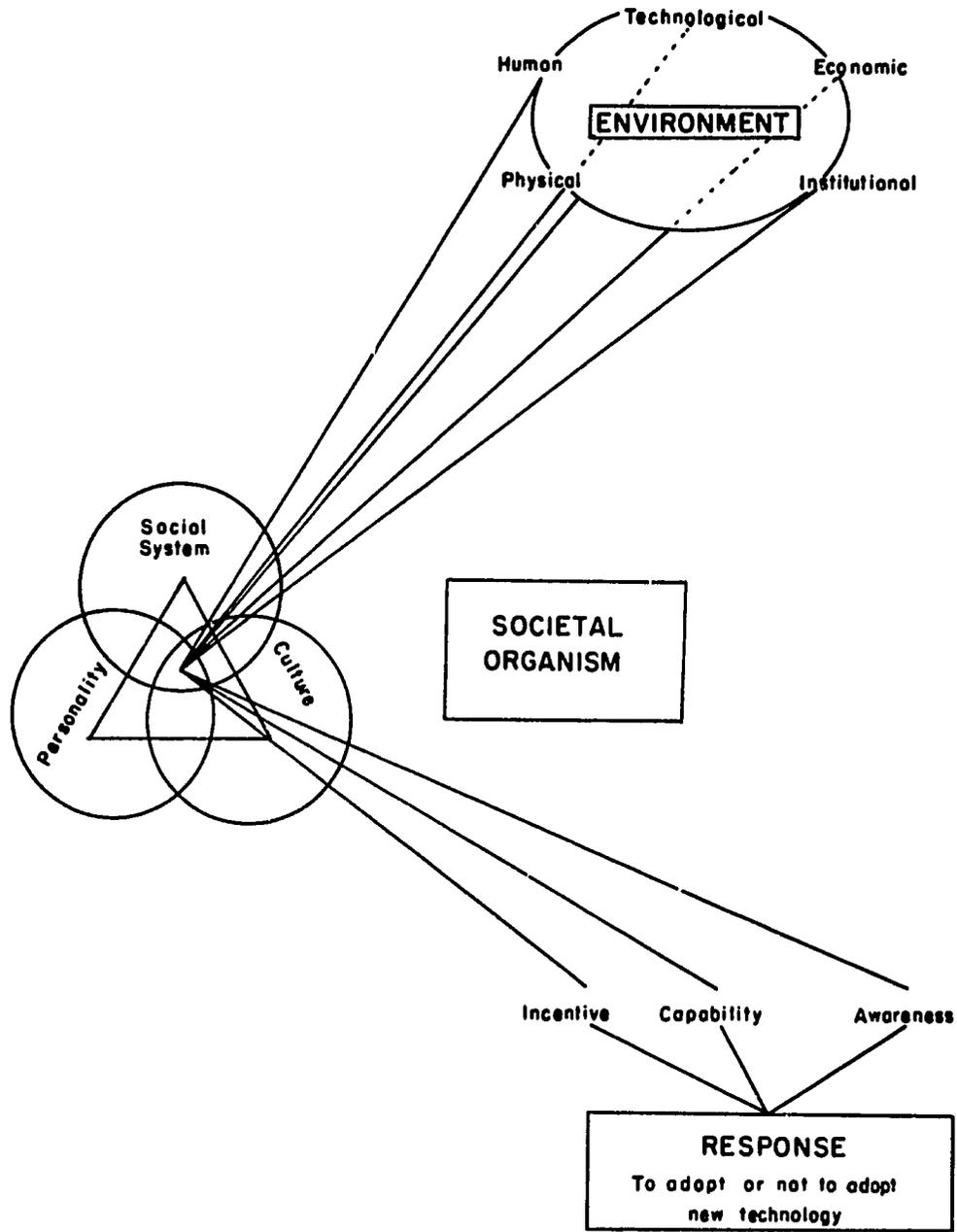


Figure 3. The Social Ecology : A Conceptualization

proposed innovations and prognosing the likely results of developmental efforts. The upper portion of the diagram highlights the dichotomy between the environment and the societal organism.¹ From the interaction of the environment and the societal organism springs the social ecology. To show the dynamic connection between these components, an analogy will be drawn from physics and the analysis of light: just as the colors of the rainbow emerge when white light is diffracted by a prism, so the form and content of the social ecology becomes apparent when the features of the environment are diffracted by the societal organism.²

The environment and the societal organism represent a panorama of the social ecology in which human beings act and behave.³ The components comprising the model are focal nodes that indicate the kind of

¹The idea to incorporate the environmental component to the societal organism came from readings written by Parsons. In Societies: Evolutionary and Comparative Perspectives (1966:1-29) Parsons develops a paradigm of evolutionary change in which he distinguishes between the "human action system" comprising the following four subsystems--social system, cultural system, personality system and behavioral organism--and the "environment of action" including the "ultimate reality" environment and the physical-organic environment. My classification of the social ecology, though simpler and more restrictive, is somewhat similar to Parsons' conceptualization of the action environment.

²The notion of this prismatic analogy came from the writings of Fred W. Riggs, Administration in Developing Countries: The Theory of Prismatic Society (1964).

³The distinction between the societal organism and the environment as illustrated in Figure 2, is not so clear as might at first be apparent. These two components of the social ecology are not contrasting or mutually exclusive terms. The societal organism and the environment have a symbiotic relationship. For purposes of analysis, however, it is permissible to differentiate between these two components.

information that is relevant. The network which ties these components together emphasizes the interrelationships of these factors.

When fundamental changes occur in any part of the social ecology, reverberations will take place throughout the system. Thus, for instance, changes in the characteristics of the technological environment accompanying the adoption of modern mechanized equipment, would alter the environment of the social ecology which would affect, in turn, certain personalities of members of society. Arrangements of power within the social system could be affected by such changes. And over a period of time, the patterns of culture could be altered by such impacts.

As members of society (who are the living components of the societal organism) interact with the environment they obtain awareness, capabilities, and incentives.⁴ The awareness, capability, and motivational characteristics of farmers who typify society are primary determinants of whether proposed innovations are accepted or rejected and whether socioeconomic development, growth without development, or degenerative change takes place over time.

The Environment

The environment consists of those elements which can be empirically observed to which farmer cultivators are actually or potentially responsive. By taking an inventory of the environment, factors relevant

⁴The inspiration for using the awareness, capability, and incentive network in the analysis of the human element originated from class discussions in Dr. David Brown's course entitled, "Agriculture and Rural Planning" (4250), University of Tennessee, Summer, 1971.

to increasing agricultural production become apparent. As it is a bit awkward to classify all external elements under the rubric of "the environment," it is useful to disaggregate this concept into subenvironments as follows: physical, technological, human, institutional, and economic environments. It then becomes possible to enumerate the observations gathered in a more meaningful way under these subenvironmental headings.

The components of the social organism--personality, culture, social system--can be considered either inclusive of or exclusive from the environment. When the focus is specifically on one of these elements, the characteristics of the other two may be considered given facts and therefore part of the environment. In a study of dominant personalities within society, for instance, the features of the social and cultural system are associated with the environment in which the personality organism is considered endogenous. Then, for example, power arrangements in the social system may be categorized as the hierarchical authority in the institutional environment.

The relevant "physical" features of the environment deal with the agronomic potential. Such variables as existing topography, fluctuations in rainfall, variations in the evaporation index, and the dominant characteristics of the major soil types are considered important factors of the physical environment. The "technological" environment contains information relative to the availability and use of capital inputs, such as carts, draft animals, and tillage implements, employed by the farmer in the act of producing. The "human" facet of the environment deals with characteristics of the population such as

size, educational levels, and energy capacities. Factors classified underneath the institutional rubric would contain (a) information about the indigenous structure, such as the size of farms and the relative distribution and parcelization of fields; and (b) information concerning the public infrastructure, such as legal sanctions, network of roads, and the repair, market, and credit sources. Finally, the "economic" factors would include facts like prices of commodities, employment opportunities, factor mobility, income distribution, and capital accumulation.

The Societal Organism

People from different societies but similar physical settings, respond to their environment in different ways. In other words, members of society interpret the environment and are instrumental in giving shape and form to it. The manner in which they adapt themselves to and manipulate particular elements in their surroundings are unique.

While it is commonplace to say that human beings do not perceive the environment in the same way, it is not so obvious, perhaps, to note the extent to which perception resides in those who do the perceiving and not in the external world (Stewart, 1971:9). In order to simplify the complexity of the perceptual world, man and his society have developed fixed images and opinions about objects and events. Thus, the farmer cultivator and the village level worker may have quite different ideas about the likely results of proposed change and the kind of considerations which should be made before a decision is made to adopt innovations. The farmer, for instance, could magnify problems associated with acquiring

the necessary skills to change his ways. The village level worker, on the other hand, could overemphasize the probability for success with the new technology under village conditions.

Furthermore, there may be differing views about what goals are important. The professional change agent may believe that money income is relatively more important than security. But the tradition bound farmer, desirous of maintaining security, might not even consider making a profit an inducement to alter the indigenous technology.

In order to gain an understanding of what and how people in a different society perceive the environment, it is useful to study the following prismatic elements: (1) personality, (2) culture, and (3) social system.⁵ These three elements reveal characteristics of the societal organism. The societal organism is actually or potentially responsive to and influenced by external conditions of the environment. With a comprehension of the social organism the relation between members of the client society and their environment, which is the social ecology, is rendered more understandable.

Culture has been defined as being "that complex whole which includes knowledge, belief, art, morals, laws, custom, and other capabilities and habits acquired by man as a member of society" (Tylor, 1958:1). Culture provides a meaningful orientation of the social system and the personality system toward the environment through the maintenance of

⁵The inspiration to focus on personality, culture and the social system as being the three basic elements that contain characteristics which distinguish one societal organism from another came from Everett E. Hagen's discussion--"Defining Societies"--in Appendix 4 in On the Theory of Social Change (1962).

patterns. These patterns have evolved over a long period of time and under varying circumstances, and can be altered only gradually. As culture is reflected by every member of society, each individual may influence the configurations of culture. However as culture is also a composite phenomenon, individuals can affect the pattern of culture only in a marginal fashion.

Personality may be defined as "the complex of qualities other than purely bodily ones which determine how an individual will behave in any given situation" (Hagen, 1962:99). Attributes of personality are linked to the attributes of the cultural system. Culture provides an orientation of the personalities of members of society. And the degree to which the members of society internalize their cultural values and norms determines the extent to which the culture can sustain itself against outside strain and stress.

The interaction of the cultural patterns with the personalities of members of society reveals the structure of the social system. For example, individuals with particular dominant personalities sanctioned by the cultural system are likely to ascend to high positions (religious, political) in society which becomes institutionalized as part of the social system. Likewise, as the social system deals with the relationships between individuals and groups, it links personalities to the culture. Individuals are portrayed by personality traits. Groups are exemplified by the characteristics of culture. The primary function of the social structure is to integrate individuals (or their personalities) to their culture.

Each one of the prismatic elements represents a different approach in describing the societal organism that has been subjected to the influence of the environment.⁶ Symbolizing the interrelationships between the prismatic elements are the three overlapping circles in Figure 3, page 42. In theory, given a snapshot where the features of the environment are known, and where the features of one of the prismatic elements are fully comprehended, the characteristics of the other two elements can then be deduced (Hagen, 1962:84-85). This suggests that should the social structure be altered in a discernible way with the diffusion of an innovation, concomitant changes in the complexion of personalities and the features of culture could be anticipated.

In this discussion two assumptions have been made: (1) at the moment of inspection, the societal organism is in static equilibrium; and (2) perfect knowledge about the prismatic elements is obtainable. These assumptions permit the disclosure of certain interrelationships between the components of the social ecology.

In other respects, however, these assumptions are restrictive. It is not possible to capture the essence of dynamic relationships through static analysis. It is unrealistic, given the autonomy of man, to assume that no gaps in knowledge exist regarding the principles governing human behavior and the nature of the societal organism. Hence, there is always indeterminacy concerning each of the three human prismatic elements.

⁶In sociology, anthropology, and psychology attention is concentrated upon the social system, culture, and personality respectively. Hagen (1962:85) states, "To a considerable degree, the fact by which the three disciplines characterize societies are the same facts seen from different viewpoints."

Furthermore, as an understanding about either the social system, personality, or culture is not comprehensive, an explanation of one of these prismatic elements does not reveal a complete picture of the impact that the other two elements have on shaping the environment. Because of the interrelationships between these three prismatic elements, however, knowledge about any one of them helps one to deduce facts about the other two and thus contributes to an understanding of the role the human element of society plays in the development process.

Appendix to Chapter IV: An Economic Translation

A translated statement of the framework, at any one point in time and in more conventional economic terms, is summarized in Figure 4.⁷ The production possibility curves symbolize the "extent" to which the environment, given technical constraints, can be transformed into pay-offs such as increasing income, production, and welfare outputs. For instance, given two similar settings, one in which animal traction was employed (environment B) and the other in which dabas were used (environment A), the first would be designated by a higher production possibilities curve than the second as is illustrated in the diagram.

However, whether the amount of output produced is greater in setting B than in setting A is dependent not only upon the richness of the technological environment but also on how the societal organism interprets its factor endowment and values alternative courses of action.

⁷The schematic presentation in Figure 3, page 42, is an adaptation of Mellor's (1963) "limited aspirations" model.

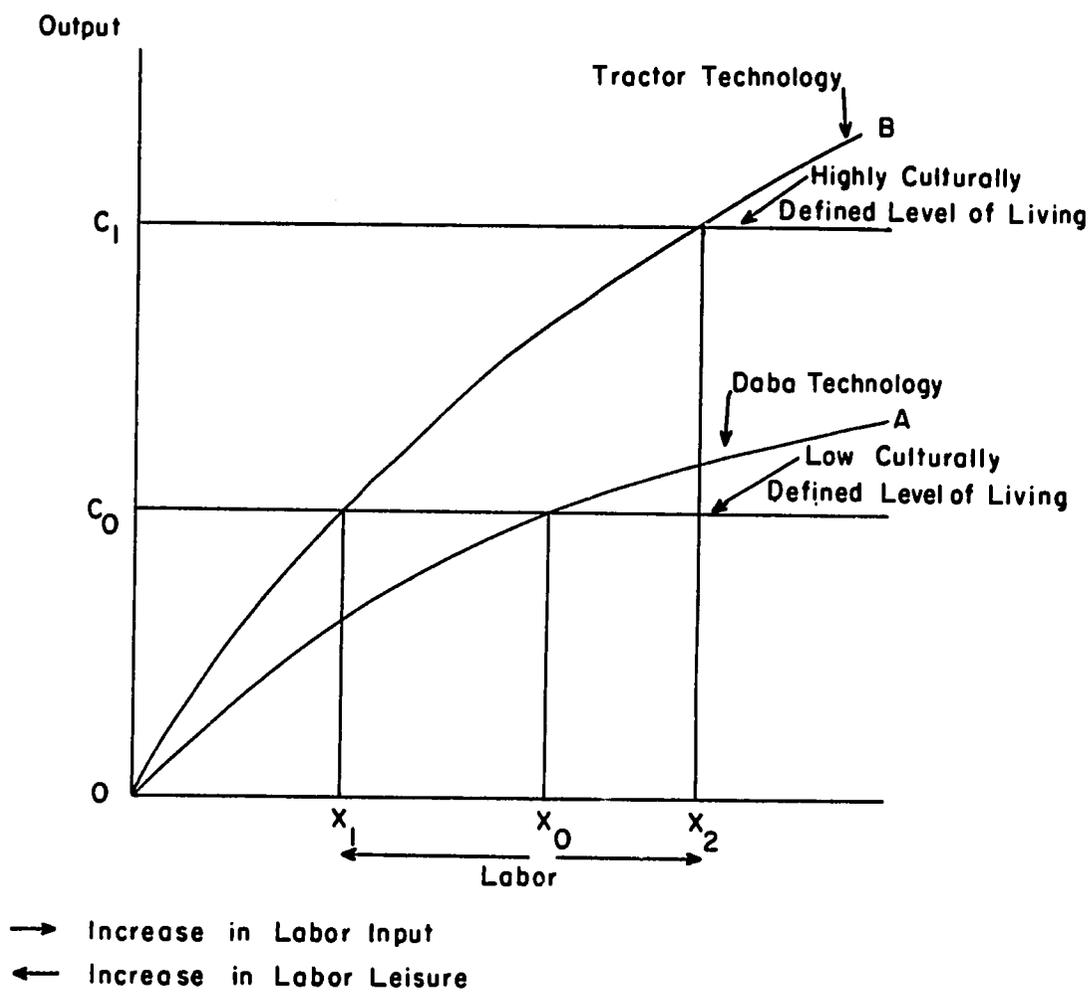


Figure 4. A Schematic Representation of Production Possibilities Given the Level of Technology and the Culturally Defined Level of Living

Suppose for instance, that the culturally defined level of living is equal to OC in both settings. Then in setting A where dabas were used OX_0 units of labor input would be employed with the economic payoffs equal to OC. In setting B where more productive mechanized equipment was employed, $OX_1 - OX_0$ fewer units of labor input would be used as only OX_1 units of input would be required to achieve the acceptable level of living OC. In this situation, the adoption of animal traction technology would not result in an increase in output but rather would generate an increase in leisure for the farmers.

However should the introduction of modern techniques in setting B cause the aspiration level of the client population to increase, a higher standard of living would result--denoted by the new culturally defined level of living line C'. In this event, farmers would discontinue the daba technology in favor of the animal traction technology even though the use of animal drawn equipment would require more labor input, OX_2 and would mean less leisure for the farmer.

It becomes obvious from the presentation above that, given the production possibilities, the "actual level" of output which occurs is determined by the culturally defined level of living established by the societal organism.

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CHAPTER V

THE PRISMATIC ELEMENTS: ELABORATIONS AND ILLUSTRATIONS

The controversy over what kind of tillage technology would be most appropriate to the factor endowment in the Koupela ORD remains unsettled.¹ There are still many unresolved issues regarding the cost and benefit of alternative forms of technology. There is a consensus, however, that the daba technology does not equip the farmer cultivator with sufficient power to enable him to substantially increase his output. Labor bottlenecks, for instance, appear in preparing the soil before planting and in weeding the fields on time. This prevents the farmer from increasing his production and thus augmenting his income and ameliorating his level of living. There is general agreement that the use of modern tillage equipment would eliminate these labor bottlenecks.

A number of economic and technical feasibility studies have been conducted throughout equatorial Africa assessing various form of

¹Information related to the adjustment capacity of the Koupela ORD to animal and motorized traction is not very accessible. It has been over three years since I was in Upper Volta and the decision to write about the mechanization controversy was made after my return home. Thus, I have not been in a position to gather detailed information about the physical, institutional, human, economic and technological characteristics of the Koupela environment pertinent to an analysis of the mechanization issue. Nor has it been possible for me to anticipate the reaction of farmer cultivators to proposed changes in the technological environment by conducting an opinion survey and by drawing up a complete check list of things, events, and activities in the client society as is suggested in Chapter VI. I therefore will not, and indeed cannot, pass judgment in regard to which particular form of mechanized technology would best satisfy the needs and growth potential of farmer cultivators in the Koupela ORD.

mechanized technology (Defraigne, 1967; Garin, 1966; Joy, 1960; Kline et al., 1969; Lawes, 1966; Morel, 1964; Senghor, 1965). In these studies, recommendations are often made which vary in accordance with the specific situation. Underlying the recommendations is the implicit assumption that modern technology once adopted would prove to be superior to the indigenous technology. The new tillage implements which have been introduced appear economically and technically feasible. Yet farmers have often not incorporated the new equipment into their farming program.

One is reminded of the situation in Koudougou where the houe Manga, a multipurpose cultivator designed specifically to meet the needs of the Voltaic farmer, was not adopted (deWilde. et al., 1967:II-374). There is little danger that the houe Manga is any more detrimental than the daba to the thin layer of topsoil found in many regions. The teeth of the houe Manga merely "scratch" the earth to a depth of three or four centimeters. But this advantage may also be its shortcoming. Farmers complain that the houe Manga actually fosters weed growth as it aerates the soil without penetrating deep enough to smother the noxious weeds. According to Father Chaix,² the inventor of the houe Manga, there is a technical solution to the weed problem. He asserts, "If the houe Manga is run quickly over the field a second time--approximately eight days after the first cultivation--the undesirable weeds will be killed."

But farmers like to begin sowing as soon as is possible after the

²Father Chaix presented his views concerning the houe Manga to me at the Christian mission of Saba, a suburb of Ouagadougou, in July, 1970.

first monsoonal rains. In order for the ground to be soft enough to do the first plowing, 25 mm of rain (roughly equivalent to two rainy days) must have fallen. But only one-half day of rain is required to make the soil malleable to the point that the farmer can break the topsoil and sow seed with his daba. Thus, unless the first rains occur in two consecutive days, the farmer loses more than eight or nine days using the "Chaix" technique.

It is questionable whether the farmer cultivator would be willing to alter his farming pattern to the extent necessary for implementation of Chaix's technical solution. Given the farmer cultivator's proclivity to sow immediately after the first rains, there will be resistance to the idea of waiting another eight, nine, or more days so that a second plowing operation can be performed before planting. Yet, the houe Manga has no chance of proving itself to be an effective cultivating instrument unless the procedure outlined is undertaken.

As this example shows, the success or failure of mechanization programs depend not only upon the profitability of the modern technique when used correctly but also upon how the client population perceive the particular innovation that is being promoted in relation to the environment. The likelihood that various kinds of mechanized innovations could be assimilated successfully in the Koupela ORD can be deduced from a portrayal of dominant features of society contained in a profile of the social ecology as was sketched out in Figure 3, page 42. In evaluating the feasibility of alternative innovations, the change agent must address himself to many issues that concern the adjustment capacity of the environment and the societal organism to technological change and the ramifications which accompany such change.

Hopefully, the model outlined in Figure 3, page 42, will prove useful to change agents interested in promoting new technology. It may provide a point of reference from which policy analysts, program designers, and village level workers will be better able to raise the right kind of questions. The answers to these questions yield a deeper understanding into the nature of the indigenous social ecology as perceived by the farmer cultivator population. This knowledge enables the change agent to be better able to prognose the likely response to modern technology and to be more effective in influencing behavior of farmer cultivators to proposed change.

No attempt will be made to draw a profile of the Koupela ORD ecology; this is the task for change agents in Upper Volta. Rather, attention will be focused on the components of the societal organism--the social system, personality, and culture. Analytical concepts will be derived that are useful in diagnosing important features of the societal organism related to land allocation, work organization, and product distribution.³ Knowledge of these indigenous institutions enables the change agent to prognose the likely response of the client population to proposed innovative change.

The Effect of the Social System

The study of social systems focuses attention upon the

³Hammond asserts that the economic system of the Mossi (one of the primary ethnic groups in the Koupela ORD) can be understood by analyzing "the way they allocate productive goods, the way they organize themselves for work, and the way they organize the distribution of the products of their work" (Hammond, 1966:71). Much of the material in this chapter comes from his book entitled, Yatenga.

relationships of human individuals with different personalities engaged in different roles. Out of the process of human interaction emerge regularities, such as value orientations and interaction patterns which characterize social systems. The fact that these regularities tend to be maintained from generation to generation may be attributed to the cultural influence.⁴

The concept of social role is central to the analysis of the social ecology in general and the social system in particular. Kluckhohn and Strodtbeck (1961:33) contend that as the term "social role" is used so widely in so many disciplines, "it has a great potential as a conceptual bridge for crossing over the chasms between these disciplines which differing theoretical interests and differing selections of universes of discourse have created." Parsons et al. (1951:190) define social role as "the point of contact between the system of action of the individual actor and the social system." And according to Belshaw (1970:74), "The arrangement of social roles may be thought of as the basis of social structure, and the activities manifest in social roles the basis of social organization."

A social role is a cluster of behavior that is integrated into the social system and which provides meaning for other role relationships in society. Clusters of behavior are associated with purposive, coordinated action. Observers both within and outside of society can

⁴As Loomis has pointed out, maintenance of social systems by culture refers not to static equilibrium but rather to moving equilibrium (Loomis, 1957:8-11). Once changes occur, the interrelations and orderings of elements within the social system are strained. However, these strains set up processes which tend to re-establish equilibrium.

therefore identify social roles. Most roles are named by society. The village change agent, acting in the capacity of a researcher, should take note, however, of significant clusters of behavior which are not identified verbally but which are important in regards to development.

Fundamental role groups may be identified by conscious indicators of solidarity that reflect the organic unit of the group under question. Solidarity is achieved through mutual dependence and is affected through the exchange of such services as obtaining food, sexual satisfaction, protection and information. An indication of the solidarity of the group is obtained by noting the extent to which there is agreement as to common goals and norms and the extent to which there is identification with the same values.⁵ As these values are translated into organization, the group becomes stronger. Another indication of solidarity is the extent to which coordination of activities takes place.

As agents of social change, village level workers should question the instrumental effectiveness of roles which contribute to the satisfaction of the values of society. The instrumentality of certain roles, such as that of a blacksmith, are clear. The instrumentality of other roles, for instance that of a brother, are less clear but may be disentangled.

In assessing the instrumentality of traditional and modern power arrangements in society, "it is necessary to examine the degree to which those who occupy roles where power is located (a) react constructively to

⁵Kluckhohn and Strodtbeck (1961:32-41) have devised a theoretical marriage between the theory of variations in value orientations and the theory of social roles to make the concept of social roles stronger.

the changing decisions and positions of others; and (b) succeed in the effective co-ordination of those who are subject to their authority, influence, and exercise of social wealth" (Belshaw, 1970:97).

By defining clusters of behavior, noting their interrelations and their instrumentality, it is possible to recognize areas in which reorganization of the social structure can improve and make more effective the joint activity of humans.

Illustrations of the Concept of Social Role

The concept of social role will be used to assist in explaining the Voltaic pattern of land occupation in the Koupela ORD. The system of land allocation is quite unlike that which prevails in the Western world. Land cannot be exchanged for money in Upper Volta as the farmer cultivator does not possess exclusive ownership. Groups other than the farmer proprietor and his immediate family have a vested interest in the land and claim certain rights. These groups are in ascending order of authority, the nuclear or extended family, the patriclan, the sib lineage, and the village. There is a special chief for each one of these groups. Respectively, they are the male head of the family, the patriclan chief, the sib headman, and the village chief.

The Village Chief. The patriclan (saka, hallu) is the residential kin grouping. It is composed of mud huts with conical thatched roofs which are joined together with either straw or mud walls. Such residences vary considerably in size ranging from five to seventy inhabitants. They may consist of large polygamous families or small monogamous nuclear families. The patriclan is the basic socioeconomic unit. Several patriclans are usually clustered together in small neighborhoods. An assembly

of these neighborhoods make up a village.

The head of the village is the village chief. He is responsible for the internal and external well-being of the territory over which he possesses final temporal authority. In return for his services, farmers throughout the village assist the chief on his farm. And at the end of the growing season, they pay a tribute to the chief of grain harvested from their own fields.

The village chief uses his power and wealth to insure the welfare of the village inhabitants. He allocates land (not granted to the lineage) to farmers who request additional farmland. In periods of famine, he provides his subjects with grain from the granaries to feed the hungry. And in order to insure harmonious relations with the outside world, the village chief provides food and lodging for visitors and often presents them with gifts of millet water, millet beer, grain, and small animals, especially fowl.

The Sib Headman. The sib headman possesses final ecclesiastical authority over the land that belongs to the lineage or kin group.⁶ This authority is sanctioned by the ancestral spirits. The sib headman is responsible for keeping land that was first cultivated by the ancestors within the lineage fold. He delegates powers of supervision to lineage elders. These elders are also the chiefs of individual patricians. They confer with the sib headman from time-to-time about issues of land use and land rights.

⁶Due to lineage fission, a farmer from a particular kin group may not live in the same village as the sib headman.

The Patriclan Chief. At the helm of each patriclan is a compound chief (sakakasm, halgan). He allocates the land to each male head in the patriclan. He determines which fields will be left fallow and which fields will be tilled on a communal basis by members of the family living in the compound. The patriclan chief rations grain from the communal granaries to members of the extended family. Most importantly he has to make sure that the resources of the household are used "to build and maintain the nexus of socioeconomic relationships that provided wives for the male members of the household and to meet his obligations in the political hierarchy" (Skinner, 1964:123).

The Male Head of Nuclear Family. In a similar fashion, the male head of each nuclear or extended family (yirisoba, kirinamba) is the director of economic activities in his household. He apportions land to be cultivated by his wives and children; determines what land will be used for the family's communal field and what land will lie fallow. He is responsible for assuring that his family has sufficient food and clothing. He judiciously distributes millet and sorghum from the family's granaries. He determines how much cotton should be woven locally to provide clothing for the family and how much should be sold in the open market to buy meat, salt, kola nuts, sugar and other products.

From the above descriptions there is evidence that an inverse relation exists between final and immediate control over farmland.⁷ The individual farmer cultivator, be he male or female, has immediate control

⁷Hammond (1966:153) concludes, "The 'higher' the office and the more elaborate its sumptuary and ritual accoutrements the less is its real power."

over the fields from which the produce gathered at harvest is stored in his own granaries. Should there be a dispute over some land, authority figures act as arbitrators. An attempt is made to resolve disputes at low levels of authority. If this is not possible, more important chiefs are requested to interfere.

The Effect of Culture

Broadly speaking, culture is a complex and comprehensive phenomena that consists of everything members of society think, do, and have.⁸ It functions as a means of relating man to the earth and as a means of relating man to man (White, 1957:8).

The nature of culture may be clarified by considering terms which are synonymous.⁹ One synonym for culture is "learned ways of behavior." This phrase indicates that culture is transmitted by learning through associations with human beings and not by genes. In other words, culture is socially acquired. An individual from outside the rural Voltaic culture, for instance, would have difficulty in discerning one weed variety from another. The indigenous inhabitant, on the other hand, is able not only to identify the local vegetation but he can draw the connection between the kind of weed spread and the ability of specific crops to grow on the land.

⁸There are many definitions of culture: A. L. Kroeber and C. Kluckhohn have analyzed 160 definitions in Culture: A Critical Review of Concepts and Definitions (1952). These definitions are related to the system of thought of such disciplines as anthropology, sociology, and psychology.

⁹In order to convey more exact meanings to the word "culture," Bierstedt et al. (1964:52-56) suggest looking at such expressions as "learned ways of behavior, social heritage, and superorganic," which are used as synonyms.

Another synonym for culture is "social heritage." This term conveys the notion that culture is the content of social relations over time. Social heritage is similar to the flow of a river which is never the same but always subject to change. "It springs from the group's past, rules over its present and influences its future" (deSchlippe, 1956:239). In Upper Volta, for instance, the notion of family solidarity continues to prevail. Exemplifying family unity is the fashion in which farming activities are organized. Tillage is often performed by members of the extended family working together on communal plots. Village elders assert that since independence was gained in 1960, the organization and distribution of production has been somewhat disrupted. Farmers tend to pay less homage to tradition and authority figures. As a consequence, there has been an increase in the size and number of individually tilled plots. Despite these developments, however, everyone still works on the communal fields. Retention of cooperative organization of farming may be attributed to the influence of the Voltaic cultural heritage.

A third synonym is "superorganic." This word focuses attention upon the social meaning, as opposed to the physical and biological meanings of objects and acts. Superorganic interpretations explain why people inherit, employ, transmute, add to, and transmit accumulated resources in the manner that they do. A typical Voltaic farmer, for instance, has cultural reasons for having fields which are scattered with plants and not ordered in a systematic fashion. He is not likely to heed the advice of the agricultural agent who encourages him to sow in rows so as to maximize yields from a given field. Relying upon the daba technology, the farmer cultivator frequently solicits the aid of

his kinsmen in tilling the soil. Should the size of the field be large, he may have women prepare food and beverage and he may call upon musicians to come and beat drums and chant songs to stimulate the workers. The laborers break the land for planting, throw weeds aside, and sow seed in quick succession while dancing, keeping rhythm to the music. The event often becomes a festive affair which gains social significance that may transcend the importance of making optimal use of the land for production purposes.

Every culture has established mores and folkways which govern human behavior. Each culture, therefore, should be studied in its own terms. Though general definitions and synonyms of culture are useful, they are not sufficient for gaining an understanding of a particular society. It is necessary to know the complex of specific cultural factors.

In order to direct thinking about the relevancy and importance of cultural factors, it is helpful to know the general structural arrangement of cultural systems. The structural arrangement may be discovered by disaggregating the concept of culture and inspecting its various components.¹⁰ Taking the broad definition of culture as a point of departure, there are three components of culture corresponding with what a society thinks, does, and has. Respectively, they are ideas, norms, and material (Bierstedt et al., 1964:64-73).

Illustrations of the Cultural Components

Material. The material components of culture includes the stock

¹⁰The functional relationships of any cultural system is the inter-relations between the structural components.

of resources and capabilities which members of society have and use. One basic material aspect of every culture (especially germane to farming communities) is land. In order to make accurate assessments about the feasibility of introducing innovations that would increase agricultural production but which would require redistribution of land holdings, it is important to understand indigenous land arrangements.

In the Koupela ORD the two primary ethnic groups of farmers are the Mossi and the Bissa. The average size of the family farm among the Mossi is three and one-half hectares and among the Bissa is five hectares. There are three and one-half adult working members in the typical Mossi family and five adult working members in the average Bissa family (Préault, 1970:26-27). Each farmer can cultivate approximately one hectare of farmland using the daba. The size of these farms are small for animal or motorized technology. The problem of scale is aggravated by the fact that the family farm does not consist of fields which are contiguous. The most desirable plots are situated just outside the compound walls. These fields are readily accessible. They are fertile because the droppings of chicken, guinea fowl, goats, and sheep, as well as humans, replenish the soil with nutrients. Generally speaking, the farther one goes from the village area, the less fertile are the fields until the periphery of the bush is reached.¹¹ The bush fields are fertile but the distance to the homestead may be as far as 20 kilometers. Such long distances discourage the farmer cultivator from further exploiting these areas.

¹¹The bush is the forest-savanna regions that envelope civilized areas.

Ideas. In order to gain an understanding of the institutional land arrangements, it is useful to examine farmer's ideas about rights to land ownership and societal norms governing land use. Ideas are notions about the universe which may be either myths or scientific truths. The Voltaic farmer has this to say about land: "Land is the mother; it fed the ancestors of this generation; it feeds the present generation and its children; and it provides the final resting place for all men" (Skinner, 1964:107).

Farmer cultivators in the Koupela ORD believe that land has no value apart from the people. They also believe that people cannot exist without land. Land is regarded as a god-given right of a sacred nature. As a right, it should not be an object of commercial transactions. It belongs to the extended family and the lineage. Living members of the kin group should not dispose of it.

The Mossi and the Bissa believe that the right to land was awarded to their lineage ancestors who first tilled the land. The spirits of the original ancestors as well as the spirits of deceased elders in the extended family since those early times continue to watch over the land and the living members of the lineage. These spirits are concerned that traditional arrangements are not abrogated.¹² It is important that the living descendants conduct themselves in accordance with the established

¹²The ancestors "established by their own comportment the pattern for correct conduct in all aspects of life" (Hammond, 1966:179). They regard farmers with good fortune as long as the living observe traditional prohibitions, such as keeping land within the lineage fold, and participate in religious ceremonies (Hammond, 1966:165). Good fortune could mean the assurance of fertility of the fields and the abundance of rains. Failure to propitiate the gods may result in punishment resulting in crop failure, sickness, or even death.

patterns of behavior. They are exhorted, therefore, to maintain traditional land holding practices.

From the importance given the idea of maintaining land arrangements established by the early lineage ancestors, it might appear that the Mossi and Bissa cultures are excessively rigid in regards to alterations of land holdings. Over the course of time, needs change. The relative fertility and potential productivity of land held by a particular kin group may deteriorate. Lineage fission may result in the virtual disappearance of certain clans. The size of some nuclear families may contract due to illnesses, absences, or death. Neighboring families may expand due to marriages and births.

The idea of inheritance is not in-and-of-itself sufficiently flexible to deal with all changing circumstances. There must be another way whereby traditional land holdings can be redistributed in response to changing needs.

Norms. At this point, it might be useful to employ the concept of norms. According to Bierstedt et al. (1964:69) norms are standardized modes of behavior that regularize human conduct and make society orderly. An accepted mode for a farmer cultivator to secure land in the Koupela ORD is to borrow farmland from a neighbor who has more fields than he can effectively use¹³ (Hammond, 1966:74-75). The norm of borrowing land is not entirely consistent with the notion that inheritance dictates land

¹³To minimize conflict between lineages, land is usually borrowed from a kinsman. Yet land may be secured from another lineage when need requires that such loans be made. In this event, the borrower makes a gift to the lender after each harvest as a means of reaffirming the original proprietor's rights to the land (Hammond, 1966:75).

holding patterns. The longer a borrower retains use of the land the stronger become his rights of occupancy and ownership. Yet this norm lends support to the idea that every individual should have land in order to live.

The Effect of Personality

In order to understand the societal organism, it is important that the change agent know his clients. However, the village level worker tends to underidentify with the mass of farmer cultivators to whom developmental efforts should be addressed. As a consequence, he cannot give adequate explanations for farmer cultivators' behavior. Knowledge of personalities which characterize members of the client population would enable the village level worker to better understand what motivates individual farmer cultivators to act and what impels them to react to modern agricultural programs in the way they do.

Here "personality" will be used in the sense employed by the Dictionary of Social Sciences where it is defined as "the organization of the person" (Gould, 1964:495). The village level worker can identify different kinds of personalities by observing what consistencies of choice emerge as farmer cultivators go through the process of selecting competitive forms of behavior in consecutive situations.

Hagen, in his book On the Theory of Social Change, emphasizes the importance of studying personalities. He (1962:88-97) identifies two types of personalities--the innovative and authoritarian personalities. The person with an innovative personality is open to new experience. More than the average individual he possesses a creative imagination,

intelligence, and energy; has a sense of a duty to achieve; has confidence in his own evaluations; and receives satisfaction confronting problems and resolving confusion. The innovative individual possesses an unconscious alertness which enables him to note differences in everyday phenomenon and to appreciate the significance of these differences. He is able to become detached from himself and his society. And, as Hagen notes, detachment seems to be an integral part of creativity: "It is difficult to see how any person can manipulate the world about him, put its elements together to obtain new ways to obtain new order, except as he sees it as a system outside himself, detached from himself" (Hagen, 1962:91).

The characteristics of the person with an authoritarian personality are by-and-large simply the negative characteristics of the creative individual. The authoritarian individual resolves relationships with his fellow primarily on the basis of ascriptive authority, finding it comfortable to rely upon traditional rules. As a youngster, he tends to let elders evaluate a situation in order to mollify the fear of using his own initiative. As the person with authoritative personality traits moves to successive positions of authority with age, he exerts dominance over his inferiors in order to satisfy aggressive needs. However, because of feelings of anxiety about the quality of his own judgments in ambiguous situations, he presents strong resistance to the questioning of authoritative decisions or traditional ways. And as Hagen points out, "That resistance is an important obstacle to change."

Hagen's authoritarian personality portrays, in so far as the description goes, the typical farmer cultivator in Upper Volta. Rather

than draw up a comprehensive list of personality types or personality traits, it is useful to have a standard framework from which the analysis of personality in a specific situation can proceed in greater depth. Hagen (1962:100-101) has developed such a framework.

The basic attributes of personality are intelligence, energy, values, motivations, and cognitions. Intelligence indicates the capacity which an individual might display if emotional factors did not get in the way. Energy is the reserve capacity to do work that an individual has at his command. Values are the standards by which behavior is governed. Motivations may be defined as the impulse, emotion, or desire that arouses an individual to action or reaction. Cognitions are images of the world which the individual develops as he interacts with his environment. Cognitions represent basic assumptions which underlie values and motivations.

Elaboration about the intelligence and energy components of personality is not needed. They do not appear to vary significantly from one society to another. Furthermore, the importance of these two components of personality is generally understood. However, the meaning and significance of values, motivations, and cognitions that characterize a particular culture are less obvious and shall receive some attention.

Values are distinctive conceptions of the relevancy of the relationship between any object and any need, attitude, or desire as defined by the individual or the culture. Values are standards, implicit or explicit, by which behavior is governed. They determine where an individual will find it rewarding to express his needs or motivations. Values should be distinguished from motivations or needs which are inner forces arising out of immediate tensions and immediate situations.

Motivations may be defined as the impulse, emotion, or desire that arouses an individual to action or reaction. Motivations are distinguished from each other in terms of goals or the satisfaction of needs toward which behavior is directed. Every human being has a complex set of needs. Maslow (1943:370-396) has postulated in an article entitled "Hierarchy of Human Motivations" five basic needs which are arranged in a descending order of importance. The top needs do not come into force until the lower ones are met at a satisfactory level. These five needs can be arranged in a pyramid:

Self-Realization

Self-Esteem

Belonging

Security

Physiological

The physiological needs are for food, water, shelter, etc. Security needs include both physical safety and psychological security and are next in importance. Belonging to a group provides love and affection as well as self-identity. It is also associated with psychological security. Self-Esteem is in part an outcome of belonging to a group and is associated with the image one has of oneself as a person. It includes the status of the individual in the group. Self-Realization is the desire to fulfill one's potential for development in terms of one's abilities. It is associated with the desire to achieve excellence but it will only motivate action when such action will not threaten the lower level needs. Opportunity for development or achievement also has to be perceived as being present (Tully, 1971).

Cognitions are patterned images of the world which an individual develops as he interacts with the environment. These cognitions (images) contain basic assumptions about the world which act as frames of reference from which much of human behavior is directed. The process of thinking is facilitated by responding to these cognitions rather than to every stimulus.

Illustrations of Personality Features

Using the concepts of cognitions, values, and motivations, as Hagen suggested, it is possible to determine the personality or "organization of the person" within society.

Cognitions. Cognitions represent basic assumptions which underlie values and motivations. They are "images of the world" that serve as frames of reference from which much of behavior is directed. One cognition or image which the farmer cultivator in Upper Volta has of the world is that productive and essential consumptive goods should be allocated according to the principle of redistribution and reciprocity and not exchanged in the open market for individual profit. As has already been illustrated, land and foodstuffs are allocated within the kinship system by means of redistribution. Outside of the kinship system, the most important process for the exchange of goods is reciprocity. A farmer who is not able to harvest all of his crops due to illness may request the assistance of his neighbor. At a later date, the farmer will reimburse his neighbor for the labor services rendered. The content of the reimbursement varies. The farmer may give his neighbor a small animal, some corn, or he may decide to repair the wall of his neighbor's compound. Whatever form the repayment takes, it will be approximately equal to the value of the labor originally received.

These images of redistribution and reciprocity affect the way that the farmer cultivator responds to opportunities to participate in the market sector. The farmer may consider it in his economic best interest to give a portion of his monetary earnings to a bond-friend (a

non-kin friend) in need.¹⁴ This act solidifies a reciprocal relationship. And the village chief who possesses more grain than is required to satisfy subsistence needs would be more likely to redistribute the surplus by subsidizing the cost of a village festival, providing seed for the following year, assisting members of the village to pay taxes, or aiding unmarried sons with marriage payments than sell the surplus in the open market for private pecuniary gain. Even the progressive farmer who plants such cash crops as cotton and peanuts is not likely to liquidate all of his produce at the market. The Voltaic farmer does not view the land on which he works or even the labor which he himself provides as being so exclusively his own that he can dispose of his crops without incurring obligations to his kinsmen. It should be obvious that these cognitions about the ways in which commodities should be distributed limit the extent to which farmers participate in the market.

Values. As noted earlier, values are "standards by which behavior is governed." One value of particular significance is that of cooperation. From early childhood, Voltaics are inculcated with the importance of cooperation (Hammond, 1966:87). They are taught that the entire group will suffer if they fail to perform well the duties assigned to them. The value of cooperation is carried through adulthood. When someone has to perform a large task, neighbors believe that they should provide

¹⁴In describing bond friend relationships Hammond (1966:133) says that they "develop out of childhood friendships that are strengthened by occasions to render mutual aid, which results in a reciprocal obligation for support that grows into a permanent alliance perpetuated by the ongoing exchange of goods and services."

some assistance. A farmer who wants to prepare a field in the bush for cultivation, for instance, can count on his friends to provide labor in clearing the land. Indeed when many gather together to accomplish such tasks, the job is completed with considerable efficiency. By working together, farmers animate each other to do better work. Furthermore by aiding a fellow farmer they are more easily able to obtain his assistance when needed in the future.

Motivations. Motivations were defined as "the impulse, emotion, or desire that arouses an individual to action or reaction." Entrepreneurs, who have played a key role in initiating growth in the Western nations, possess high achievement motivation.¹⁵ McClelland has intensively studied the achievement motive which he calls "n Achievement," the "n" standing for need (McClelland, 1961). Individuals with high n Achievement are more concerned with attaining success than avoiding failure. They appear to prefer situations involving risk "only when

¹⁵A case has been made to promote personality change in accordance with the traits possessed by the entrepreneur through psychological education. McClelland and his followers have spearheaded this movement. It is interesting to note the outcome of such personality training programs. In 1964 a pilot personality program was conducted at the Small Industries Extension Training Institute in Hyderabad, India. The guideline of the program was McClelland's n Achievement concept. The specific object was to consciously inculcate "new ways of thinking and new types of motivations into people's lives (McClelland, 1969:107). In fact, however, psychological education proved to have a negligible effect on changing the motivations of the participants. The area in which the training program did have an impact was on the means to the attainment of the goals to which the participants directed their specific motivations. Those men who did not have a strong desire to be more active responded to the program by converting the training into a higher need for power (McClelland, 1969:335). According to the evaluators of the program, "the effect of the training depends on the initial goals of the participants."

they have some chance of influencing the outcome through their own skills and abilities" (McClelland, 1969:214). When confronted with facts, they engage in rational assessments paying attention to the realistic probabilities of success or various alternative actions in a given situation. Finally, they are more concerned with the future and are willing to forego immediate payoffs in favor of larger future rewards (Heckhausen, 1967:113-136).

It is interesting to note that many of the more achievement oriented Voltaics are usually converts to either Islam or Christianity. They often actively participate in the market (Hammond, 1966:179-184). Some obtain their livelihood as merchants. Achievement oriented activities are condoned by the modern religious faiths. The Moslem and the Christian are able to ignore some of the rigid aspects of the traditional system such as redistribution of profits among kin folk.

But most Voltaics are motivated by ascription and not by achievement. Stewart (1971:36) describes the setting where ascriptive motivations are prevalent which corresponds with the situation found in the Koupela ORD. He contends that "Individuals with an ascriptive motivation are usually enmeshed in reciprocal relations with members of their family, community or trade and profession." The source of action is not the individual, as is the case when achievement motivations are dominant, but rather the group. "The individual is perceived to belong to a social group and to behave according to the obligations, duties, and privileges inherent in his social and professional position."

The prevalence of ascriptive motivated farmers in the Koupela ORD may be explained by examining Maslow's hierarchial order of needs. Basic

physiological, security, and belonging needs are met within the indigenous culture. There is no assurance that these needs will be satisfied outside the kinship system. Thus ascriptive motivation is derived from the desire on the part of the farmer cultivator to preserve and enhance his position in the traditional social structure that guarantees satisfaction of these primary requirements. Once physiological, security and belonging needs are assured, a more conducive environment will exist for the diffusion of new technology. Adoption of modern techniques is a means whereby the farmer cultivator in Upper Volta can achieve more self-esteem and self-realization.

CHAPTER VI

A SKELETAL STRATEGY FOR DETERMINING CHARACTERISTICS OF THE SOCIAL ECOLOGY

The change agent may use the conceptual framework of the social ecology presented in Chapter IV as well as the analytical principles elaborating the prismatic elements in Chapter V to orient his thinking about what kind of modern technology is most appropriate to promote and about how innovations should be introduced. It is important, as is implied in the diagram of Figure 3, page 42, that the change agent know the environmental factors that affect development. Such knowledge would permit him to better gauge the potentialities and limitations for change and would enable him to be more effective at inducing socio-economic growth. It is also important, as is also implied by the societal organism component of Figure 3, that the change agent try to gain insight into the perception patterns of his clients. In particular, he should make note of revealed preferences, expectations, misconceptions, and uncertainties.

In order to obtain more knowledge of the environment, it would be instrumental for the change agent to draw up a check list of institutional, technological, human, economic, and physical features of the social ecology. The purpose of this check list would be to highlight those aspects of the client environment which the change agent considers important in the attainment of developmental objectives. Further, it would be useful if the village level change agent would conduct an opinion survey from which it would be possible to obtain knowledge of

the ways in which the farmer cultivator population assesses the present situation, evaluates possibilities for ameliorating their conditions, and views modern technology.

A Sample Set of Questions Related to the Societal Organism

In the writings of Kluckhohn and Strodtbeck entitled Variations in Value Orientations there are clues regarding the kind of information needed to gain insight into the nature of the societal organism. According to the authors (1961:11) each society can be differentiated from another by the "patterns of thought" which emerge due to the presence of the following problem areas common to all human groups:

1. What is the character of innate human nature?
(human nature orientation)
2. What is the relation of man to nature (and supernature)?
(man-nature orientation)
3. What is the temporal focus of human life?
(time orientation)
4. What is the modality of human activity?
(activity orientation)
5. What is the modality of man's relationship to other men?
(relational orientation)

By being aware of the existence of these common problem areas, the village level worker can raise issues and formulate questions aimed at ascertaining his client's patterned cognitions. These patterned cognitions "give order and direction to the ever-flowing stream of human acts and thought as these relate to the solution of 'common human' problems" (Kluckhohn and Strodtbeck, 1961:4).

Kluckhohn and Strodtbeck have presented a classification scheme (Table I) of value orientations with their respective range of variations which should provide the change agent with a more explicit idea of the appropriate information to seek:

TABLE I
THE FIVE VALUE ORIENTATIONS AND THE RANGE OF VARIATIONS
POSTULATED FOR EACH

Orientation	Postulated Range of Variations						
human nature	Evil		Neutral	Mixture of Good and Evil		Good	
	mutable	immutable	mutable	immutable	mutable	immutable	
man-Nature	Subjugation-to- Nature		Harmony-with- Nature		Mastery-over- Nature		
time	Past		Present		Future		
activity	Being		Being-in-Becoming		Doing		
relational	Lineality		Collaterality		Individualism		

Kluckhohn and Strodtbeck contend that in every society there is evidence of a range of variation for each of the five value orientations: human nature, man-nature, time, activity, and relational. Where these orientations differ is in the preferential ordering, "rank-order emphasis," of the alternatives.

A set of issues and questions can be formulated from the above classification scheme which could be raised in assessing feasibility of the Koupela ORD societal organism to incorporate different forms of mechanized technology. A sample set of issues and questions follows a brief discussion of each of the five value orientations:

Human Nature Orientation

The village level change agent may question under what circumstances his clients consider the character of innate human nature as being evil, good and evil, neutral, or good and whether human nature is mutable or immutable.

Issue: The implementation of modern tillage implements would require that land holdings be consolidated.

Question: To what extent is the farmer cultivator fearful of not receiving adequate compensation for land holdings relinquished for purposes of redistribution?

Issue: There is a need for joint financial undertakings.

Question: With whom would the farmer trust entering financial arrangements--his brother, bond friend, and/or neighboring non-kinsman?

Issue: Private profit must not take place at the expense of society's welfare.

Question: How would the proceeds from fields where modern tillage techniques were employed be distributed?

Man-Nature Orientation

The Voltaic farmer cultivator is often described as having attained a harmony with Nature. The right to land occupancy and land use based upon the supernatural sanction of ancestors indicates, for instance, that there is little separation between man, nature, and supernature and that the Voltaic society is coordinated into an orderly, harmonious, and unified whole. However, there are situations, such as during a period of famine, when the farmer feels subjugated by Nature. There is also evidence that the farmer cultivator has achieved a certain degree of mastery over Nature as is exemplified by the fact that wells are being dug and cemented to insure a supply of water throughout the dry season.

Issue: It is important that the new technology be viewed as not disrupting events without offering something better.

Questions: Does the farmer cultivator believe that implementation of modern technology will improve his economic level of living? How does he compare the advantages and disadvantages of animal traction versus hand implements? Does he believe that the difficulties of successfully incorporating animals into the farming pattern to outweigh the benefits? What kind of ramifications can he

foresee accompanying the diffusion of motorized equipment? If land holdings were redistributed to suit technical requirements, how would traditional claims to land ownership be affected? Would the farmer cultivator want and need some other kind of guarantee insuring him of continued accessibility to land? Or would such advantages as increased income and prestige resulting from the adoption of new tillage implements more than offset any loss in consistency of traditional beliefs?

Issue: Villagers may have developed pessimism towards new solutions because of past failures with modern techniques. In order to appease this fatalism some animistic beliefs, which are considered especially efficacious, may be manipulated.

Question: In clearing bush lands for cultivation, should certain ceremonies be performed to propitiate the local dieties?

Time Orientation

Agricultural extension agents have endeavored to convince the farmer that he should plant in rows rather than sowing at random. Indeed, many farmers have adopted this suggestion when sowing cotton and corn which are two relatively modern crops. However, the staple grains--millet and sorghum--are never planted in rows. The farmer sows these traditional crops in exactly the same way as did his ancestors. In this situation, the behavior of the farmer may be attributed to a past orientation. There are, however, many other circumstances where the farmer cultivator is not bound by tradition. The change agent can make predictions regarding the direction of change to new technical possibilities by knowing under what situations the farmer is thinking of the present, future, or past.

Issue: The farmer who chooses to change his farming pattern is often dissatisfied with the present situation.

Questions: How does the farmer compare the present state of affairs with what happened in the past? Is he optimistic towards the future?

What are the farmer's views concerning education? Does he want to send his children to school? If so, why?

What does the farmer think of those who have emigrated? What reasons can he give for these departures?

Issue: The farmer who makes future plans about what he is going to produce is more likely to be successful in implementing new technology than a farmer who does not make such projections.

Questions: Does the farmer know what kind of crops he wants to plant next year?

Does the farmer have a surplus of grain at present? What might happen to this surplus? Does he plan on saving it for a possible failure? Will he give it to a kinsman in need? Has he considered selling this surplus?

Activity Orientation

Kluckhohn and Strodtbeck (1961:15-17) state that:

The modality of human activity is the fourth of the common human problems giving rise to a value orientation system. . . . In the Being orientation the preference is for the kind of activity which is a spontaneous expression of what is conceived to be "given" in the human personality. . . . The Being-in-Becoming orientation emphasizes that kind of activity which has as its goal the development of all aspects of the self as an integrated whole. . . . The most distinguishing feature of the Doing orientation is a demand for the kind of activity which results in accomplishments that are measurable by standards conceived to be external to the acting individual.

Americans are frequently characterized as being oriented towards doing as they tend to become involved in those kinds of activities which result in visible and tangible accomplishments. In appraising the individual, a common question is "what does he do?"

The farmer cultivator in Upper Volta asks quite a different kind of question about the individual: "From what village locality does he come?" There is a tendency to identify the individual (and oneself) with the given situation. Generally speaking, the primary orientation in Upper Volta is towards being.¹

Yet, there is evidence of other kinds of activity orientation. Voltaic farmers often praise their fellow comrades who engage in productive endeavors which are outside the sphere of what is normally required or expected. In the dry season, for instance, some farmers, especially those oriented towards doing, perform such industrious activities as maintaining a garden, constructing houses, and weaving cloth.

Issue: To maximize returns from developmental efforts, the village level worker should direct his attention to those farmers who are most receptive to change. The following questions may assist him in selecting a target group of individuals with whom he should work.

Questions: Would the farmer cultivator like to use modern tillage implements? Does the farmer feel like he could adopt the new technology? Or does he consider the risk too great?

Is the farmer willing to participate in a training session during the slack agricultural season to learn how to operate and repair the modern tillage equipment?

Has the farmer tried implementing suggestions made by the agricultural extension service in the past?

¹The reason for the differences in the modality of human activity between cultures may be, in part, explained by Maslow's hierarchial order of needs. The orientation towards Being is likely to be found in those societies where the lower "physiological, security, and belonging" needs are not guaranteed. The orientation towards Doing is probably more frequent where these basic needs are satisfied but the need for "self esteem" is not yet attained. Finally, the Being-in-Becoming orientation is likely to be associated with the attempt to reach the high level of "self-realization."

What kinds of activities does the farmer engage in during the dry season? Does he have a garden? Does he maintain a mango orchard? If not, why not?

Relational Orientation

The final basic problem deals with man's relation to man. This orientation has three subdivisions--the lineal, the collateral, and the individualistic--which are differentiated between each other by the subject for whom goal attainment is sought. The subject of the lineal, collateral, and the individualistic relational orientations are respectively the culture, the immediate kinship grouping, and the individual.

Kluckhohn and Strodtbeck (1961:18-19) assert that

. . . when the individualistic principle is dominant, individual goals have primacy over the goals of specific collateral or lineal groups. . . . A dominant collateral orientation calls for a primacy of the goals and welfare of the laterally extended group². . . . If the lineal principle is dominant, group goals again have primacy, but there is the additional factor that one of the most important of these group goals is continuity through time.

Issue: Psychological conflicts are likely to occur when the farmer attempts to express his individuality by adopting modern tillage implements that are incompatible with the maintenance of traditional responsibilities. In order for the farmer to successfully adopt the new technology, he needs to possess some autonomy that would permit him to pursue private goals.

Questions: How would the farmer, who has purchased new tillage implements, maintain kinship ties? Would he feel obligated to work in the fields of his neighbor? If so, what kind of contribution would he want to make? Would he use his own daba and join the

²Kluckhohn and Strodtbeck (1961:19) state that a laterally extended group "is always moderately independent of other similar groups, and the problem of a well regulated continuity of group relationships through time is not highly critical." In Upper Volta a convenient classification of the laterally extended group would be the patriclan compound.

communal work crews? Or could he substitute this traditional form of payment with some other kind of service, such as lending his modern equipment to his neighbor or sending a younger brother who would work in his stead?

Issue: Social conflicts are likely to arise when the wealthier members of the immediate family purchase modern equipment. Villagers may have ideas concerning how to minimize social costs. The following questions would enable villagers to express their opinions which may indeed be very revealing:

Questions: How can the goals of the laterally extended patriclan be maintained and how can the welfare of this collateral group be assured? In what ways will the use of modern implements upset the traditional division of labor? Will some members of the family find that their work loads have increased while those of others have decreased? Who is likely to suffer in terms of loss of economic security? Who is likely to benefit in terms of increased status? What kind of modifications can be made to stabilize the new system?

Issue: With the diffusion of tractor or animal traction technology hierarchial arrangements of authority are likely to be affected. It would be instructive to interrogate lineal leaders (village chiefs, sib headmen, and patriclan chiefs) asking them how they view their future role in a changed situation.

Questions: Would the lineal leader want to use his influence to become instrumental in the organization of tillage cooperative endeavors? Or does he view the emergence of such institutions as a threat to his position? Is the lineal leader fearful of having his power usurped under the new situation?

A Sample Set of Questions Related to the Environment

In evaluating the feasibility of introducing mechanization programs, the change agent must make assessments of environmental resources and constraints. He should make note of existing attributes and deficiencies that determine the capacity of society to assimilate alternative forms of tillage implements. A sample set of questions are formulated that should be investigated before a decision is reached to launch a campaign of promoting modern tillage technology:

Economic Environment

1. What is the size of the typical farm?
2. What is the size of the typical farming family?
3. Are there major deviations in size of patriclan farms?
4. What are the sizes and shapes of (1) communal fields and (2) private plots?
5. To what extent are fields consolidated or fragmented?
6. What are technically and socially acceptable prospects for changing these patterns?
7. What is the income per capita?
8. What kind of credit is available to the farmer cultivator?
9. For what purposes does the farmer spend money?
10. How much is he able to save throughout the course of a year?
11. What is the availability of draft animals?
12. What is the extent of the farmer's capital accumulation?
13. What is the nature of demand for farm products and farm inputs?
14. What is the schedule of prices for export crops? Are these prices regulated?
15. What is the range of price variations for staple crops?
16. During what times of the year does the farmer cultivator exchange staple crops for cash and why?
17. What kind of employment opportunities are open to the farmer?
18. During which parts of the year is there idle labor? Are there any slack periods in the agricultural season?
19. Is the transportation network connecting farms with markets for farm products and outlets for farm equipment and supplies adequate?

Institutional Environment

1. What is the division of labor between men and women, young and old?
2. How are labor tasks organized on the communal fields?
3. How is the produce from communal fields distributed?
4. How are fields parceled to members of the patriclan?
5. What kind of crops are grown by whom and where?
6. From where is the farmer cultivator able to secure capital to purchase equipment?
7. How is the local market tied to the external market and how are external markets connected to the local market?
8. What is the procedure for selling produce for cash?
9. Who makes the sale?
10. Who receives the profits?
11. What crops are sold in the open market?
12. What crops are reserved for family consumption?
13. How much of the total production is sold and how much is consumed by the family?
14. What kind of professional service is available to the farmer?
15. What kind of educational opportunities are available to the farmer?

Human Environment

1. What kind of expectations does the typical farmer have for the future?
2. To what extent are farmers willing to delay receiving rewards?

3. How high or low is the farmer's aspirational level?
4. In what ways does he display initiative, self-confidence, and act independently?
5. What kind of anxieties and feelings of uncertainty does the farmer cultivator display?
6. Is there evidence of negativism towards developmental projects?
7. What kind of needs does the farmer consider of primary, secondary, and tertiary importance?
8. Whom would the farmer like to emulate?
9. What is the farmer's attitude towards (1) the innovative and enterprising farmer and (2) the village level worker?
10. Do village leaders and farmer cultivators understand the nature of innovative change?
11. To what extent is the farmer aware of ways in which he can increase his production and income?
12. What kind of unique skills does the farmer possess?
13. Who in the community has attended school?
14. Who in the community has lived outside the area?
15. Who are the formal leaders of the community and what functions do they perform?
16. Who are the informal leaders and what is the degree of their influence and power?

Physical Environment

1. What is the variation in rainfall and temperature throughout and between years?

2. What kind of vegetation grows on fallow and bush fields that indicate fertility?
3. What are the dominant soil types; where are they located?
4. What kinds of equipment are suited for local soils?
5. For what kind of operations can this equipment be used?
6. To what extent is the bush land being exploited for agricultural purposes?

Technological Environment

1. How many farmers have access to plowing equipment other than the daba?
2. To what extent is this equipment being used?
3. Why is some capital equipment lying idle?
4. What are the sources of farm supplies?
5. What kind of innovative technology is being introduced at present?
6. What has been the reaction to past efforts at instituting development projects?

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VITA

Thomas Lachlan Vollrath was born in Kansas City, Missouri, on May 22, 1944. He attended elementary and secondary schools in Kansas City graduating from Southwest High School in 1967. In September of that year, he entered college at the University of the South in Sewanee, Tennessee. During the spring semester of his junior year (1966), he studied at the University of Missouri at Kansas City. Returning to Sewanee the next fall, he received a Bachelor of Arts degree with honors in economics. Following commencement in Spring of 1967, he entered the Peace Corps working with the Agricultural Extension Service in Garango, Upper Volta. Upon the completion of three years of service with the Peace Corps, he accepted an Agency for International Development fellowship to study international agricultural development in the Department of Agricultural Economics and Rural Sociology at the University of Tennessee. He is a member of Gamma Sigma Delta Honorary Society. And in March of 1973 he received his Master of Science degree.