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RURAL GROWTH CENTERS:

A STRATEGY FOR THE RURAL DEVELOPMENT OF LOW INCOME COUNTRIES

A RESEARCH PROPOSAL

by

BENNETT HARRISON

The views presented in this paper are the sole responsibility of the author. The paper was prepared for the United States Agency for International Development, Office of Program and Policy Coordination, as the author's contribution to the 1967 Summer Research Project sponsored by that office. The author is a Doctoral candidate in Economics at the University of Pennsylvania.

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INTRODUCTION

1. In this paper, I offer a design for a research project which would produce a blueprint for the experimental planning of "rural growth centers" (RGC's). An RGC is a rural marketing center which has the potential for becoming a "growth pole" for its region through the location there of "packages" of agricultural, agro-industrial, and service investments. An RGC is not a "new town", nor (as will be explained subsequently) do I think they are substitutes.

2. In Chapter One, the concept of RGC's as a particular kind of rural planning strategy is developed. Chapter Two argues for a "pilot" or small-scale approach to RGC experimentation, as opposed to the "saturation" approach especially characteristic of Indian Planning. The proposed research project itself is outlined in Chapter Three, together with a discussion of each of its components, two of which have been developed sufficiently this summer to warrant separate chapters: The rudiments of several RGC case studies are contained in Chapter Four, while a suggested procedure for choosing potential RGC sites for experimentation is described in some detail in Chapter Five. I have chosen Mali, a small country in West Africa, as the subject for the textual demonstration of the latter decision "model" (the formal algorithms have been relegated to an appendix). Mali has recently undertaken an RGC experiment of sorts, with U.S. AID assistance. Finally, a partial bibliography is included, whose organization parallels that of the research project outline itself. No attempt is made herein to estimate the cost of conducting this research project.

CHAPTER ONE

RGC'S: A STRATEGY FOR RURAL DEVELOPMENT

1. In a sample of LDC's sufficiently large to warrant my basing the present analysis on their situation, the most critical short-run planning objectives are to eliminate recurring regional and/or national food shortages, and to increase net foreign exchange earnings. In these same countries, where the bulk of the population lives and works in the "rural sector", an important long-run planning objective is to bring these people into the market economy in order to raise their overall levels of living. For my purposes, these objectives may be formulated as follows:

Short-run: increase the production of export crops and food grains domestically consumed.

Long-run: undertake extensive commercialization of the rural sector; in particular, seek ways of providing extra-agricultural employment outside the major cities.

2. I have nothing to add to that "package" of instruments currently advocated for attaining these objectives: Fertilizer, water, improved seed, implements, credit, extension services, entry roads, storage facilities, etc. Rather, I wish to address myself to the question of appropriate strategies for employing these instruments.

3. With respect to the short-run objectives, the prevailing practice in many LDC's is to provide the inputs or "instruments" on a geographically dispersed basis. This often results in the insignificant generation of both immediate impacts and, what is probably more important, "demonstration" or "spread effects". Limited resources are distributed far too thinly over

large areas. This scale factor frequently places an impossible burden on extension workers. Even in the best of circumstances, they are incapable of "reaching" significant numbers of farmers on a continual basis. This geographical dispersion of rural economic activity also makes it unprofitable for firms, e.g., implements manufacturers, to invest in the advertising and distribution of their wares outside of the major cities. Finally, the same absence of spatial organization of the rural economy precludes even relatively efficient operation of rural-based light industry, without which the long-run objective is unlikely to be achieved.

4. Many years ago, Professor Albert Hirschmann attempted to teach us that the strategies we choose for employing economic and social instruments are at least as important as the instruments themselves. In particular, he emphasized the importance of our understanding that one of the principal properties of "underdevelopment" is the discontinuity of the functional linkages (exchange of goods, communication of ideas, etc.) among the sectors and areas of LDC's. Leontief said the same thing in characterizing an underdeveloped economy as, "an input-output system with an unacceptably large number of empty cells." Hirschmann advised us to seek strategies of instrument application which would build the requisite "links" into those "chains".

5. One such set of discontinuous linkages obtaining in at least all the LDC's with which I am familiar consists of economic central places linking the village economy (or, in the case of Latin America, the dispersed farms) with the major urban areas. It may be that, as John Lewis says, "There is not, as casual discussions sometimes seem to suggest, any lack of medium-sized centers lying between the villages, on the one hand, and the larger cities,

8. I am, therefore, proposing that U.S. AID invite a research project which would examine the following hypothesis:

> The experimental development of potential RGC's may provide a more effective strategy for bringing about rural economic and social change than those strategies, employed thus far, lacking an explicit central-place orientation.

If the hypothesis can be verified, then this research project should produce a "blueprint" for a series of such experiments.

9. It should have been apparent from the preceeding remarks that the marketing function provides a handle (if not <u>the</u> handle) to the planned development of those interregional and intersectoral linkages necessary for successful growth. This is so for two reasons. First, efficient distribution of goods, services and productive factors is sorely lacking in most LDC's. The second reason is a bit more subtle: most farmers engage in at least limited institutionalized exchange. This effectively <u>forces</u> them to visit and congregate in central places which facilitate marketing. In other words, <u>existing</u> market towns already have a "captive (albeit inadequate) audience" for the wares they have to display. I mention this in order to dispel any possible confusion the reader may entertain between my proposal and the "new town" concept; I am <u>not</u> advocating the construction of new rural towns as a strategy for achieving the planning objectives set out earlier. It is precisely the "captive audience" property of existing market centers which offers the greatest opportunity for transforming them into regional "growth poles". Without this "head start", I doubt seriously whether any central-place strategy, particularly a new town strategy, could have any significant short-run impact.*

* "In the phasing of the entire long-range market-town making plan the existing 1,927 towns /in India/ ought probably have first priority on the presumption that they can become functionally-useful much sooner than centers that will have to be created <u>de novo</u>." /Johnson, p. 12./

CHAPTER TWO:

SCALE AND FUNCTION: THE RELATIONSHIP BETWEEN RGC AND NATIONAL PLANNING

1. LDC resources, particularly those associated with the collection and preparation of statistics, are in very short supply, as we all know. Furthermore, there is an (altogether understandable) bias on the part of most LDC's against allocating very much of these resources to experimental, as opposed to directly productive, activities. These considerations motivate the following proposition:

> No RGC experiment will be palatable to an LDC unless it is designed (a) on a small scale and (b) in such a way as to address itself directly to the country's critical short-run planning objectives.

Professor E. A. J. Johnson of Johns Hopkins has recommended that a minimum of 300 RGC's be developed in the Kanpur region of India during the next planning period. He has argued that such a "saturation" experiment would not be prohibitively expensive, relative to the present program costs of developing Indian agriculture. It seems to me that this argument is not so much unconvincing as it is beside the point. Neither the GOI nor any other LDC government is likely to substitute any sort of highly experimental program for its present practice, at least in the short run. But if the RGC experiment is therefore to constitute an additional burden on resources, then surely Professor Johnson's plan is far too ambitious.

2. There is still another aspect of the RGC experiment which suggests that a "pilot" approach is preferable to a "saturation" policy. Organizing rural activity around networks of intermediate sized central places constitutes the creation of new institutional forms. It is every much a political as well as an economic experiment. Few "social planners" would advocate

testing the viability of new institutional forms on a large scale. Minimization of scale reduces the costs of failure, not the least of which is firm opposition to a second try with a suitably modified design. This principle has been explicitly incorporated into several of those RGC experiments which I shall describe later in this paper. In an interesting report recently prepared by Bartlett Harvey of AID/W for the Harvard University Center for International Affairs, the "pilot" approach of the East Pakistanis and the "saturation" approach of the Indian government in West Bengal are compared. The common objective is "rural development", with special attention given to the creation of implementing institutions. Mr. Harvey concludes that the contrasting choices of scale do significantly explain the relative success of the Pakistanis and the relative failure of the Indians. Again, recognition of the political elements of rural planning at least partially motivated the Ford Foundation team in 1959 to recommend to the GOI that it initiate the Intensive Agricultural District Programme on a "pilot" basis, with one experimental district in each of seven States, and perhaps five villages per district. The GOI, however, chose to implement a "saturation" policy; by 1962, there were IADP districts in all fifteen States, each including a thousand or more villages. The returns are not all in yet, but it is possible to argue that, once again, the GOI has characteristically overextended itself.

3. At the beginning of Chapter One, I set out several short-run and long-run national planning objectives which I believe to be common to a large number of countries whose welfare is of especial importance to the U.S. But even for those countries where these particular objectives are not "critical",

on the other".* The problem is that these centers, or "market towns", have not developed to the point where they can become focal points for regional economic activity, providing "growth poles" for their hinterlands and institutional capability for transmitting goods and ideas back and forth between their patrons - the peripheral farmers - and the urban enclaves of the country. They are, in other words, population but not economic centers.

6. Familiarity with any good text on European economic history, and nothing more than a high school course in U.S. history, are sufficient to make the student of development aware of the crucial role played by such chains of rural economic centers in facilitating Western development. It is not my intention, at least for the present, to attempt to discover why the evolution of market towns in LDC's seem so frequently to have become stunted. Suffice that this is a demonstrable proposition, the "discovery" of which constitutes the substance of a large (and growing) literature.

7. In recent years, there have been sporadic pleas for experimental development of market towns in LDC's, with the objective of inducing their transformation into viable centers of regional economic activity. These RGC's would be made focal points for the employment of those instruments of agricultural and rural planning presently applied according to a "saturation" (or at least a non-central-place-oriented) strategy.

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*Professor E. A. J. Johnson strongly disagrees. In Market Towns and Spatial Development in India (P. 8), he writes:

> One cannot agree with John P. Lewis' conclusion (Quiet Crisis in India, p. 172)....This appears to be a major error in an otherwise brilliant and penetrating analysis of the role of urban centers. For even if one were to assume that the 4,169 large villages (with populations in excess of 5,000) could be considered to be market towns, a charitable but wholly unrealistic assumption, there would still be one to ninety-three ratio between town and village. Unfortunately, the size of a village is no test of its capacity to perform a market-town function.

or are relatively less important than others, this basic proposition still obtains: domestic resources are not likely to be allocated to RGC experiments unless the latter place a minimal burden on those resources and unless they offer some hope of addressing themselves to the country's critical short-run national planning objectives. These considerations suggest that a viable proposal for an RGC experimental program will probably have to focus at first on a relatively small number of market towns or village clusters, and that the principal criteria for selecting the "best" prospective RGC sites will have to relate to their being located in regions which already make, or are thought to be on the threshold of making, an important contribution to national planning targets.

CHAPTER THREE

OUTLINE OF THE PROPOSED RESEARCH PROJECT

1. In this section, I present an outline of a research project which would have as its output a blueprint for a series of RGC experiments: the allocation of resource "packages" for the planned development of strategically located rural market centers. With all of the outline's components but two, I shall suggest only what I think ought to be studied, and offer some suggestions as to how this might be done. A partial bibliography is provided at the end of the paper, whose organization parallels that of this outline. The two outline components which are dealt with substantively in later chapters of <u>this</u> proposal have to do with case studies of RGC experiments already undertaken and with a procedure for selecting sites for future experimentation.

THE PROPOSED RESEARCH PROJECT

I. THE HISTORICAL AND POTENTIAL IMPORTANCE OF RGC'S

A. The Role of RGC's in the Economic Development of the West

B. Marketing Networks in LDC's

1. Inadequacy of linkages

2. Possibilities for closing the system with RGC's

C. Non-Agricultural Rural-Based Economic Activity in LDC's

1. Minimal areal, market, and infrastructural requirements for rural industry

2. Requirements for efficient rural servicing

3. Possibilities for meeting requirements by an RGC strategy

II. RGC STUDIES

A. Economic Evaluation of RGC-oriented Experiments Previously or Currently Undertaken (with special attention to the mix of instruments and facilities made available, especially housing and infrastructure).

B. Comparisons (wherever possible) of an RGC experiment with some Non Central-Place-Oriented Rural Development Program

III. A SUGGESTED RGC PLANNING STRATEGY

A. Choosing Potential RGC's

1. Selecting the critical crops: an agricultural comparative advantage study

2. Identifying a basic set of regions

a. Criteria:

1. Current production of critical crops

2. Physical capacity for future agricultural growth

3. Potential participation, as measured by rural population density

b. Choice techniques:

1. quantification of preference or "trade-off" relationships

2. construction of indices for measuring regional potential

3. Selecting a working set of potential RGC's from within the basic regions

a. Criteria:

1. sufficient distance from major cities to avoid a "dormitory effect"

2. access to some mode of all-weather transport

b. Choice techniques: construction and use of the transport-access matrix

4. Selecting the basic set of RGC's from the working set

a. General criteria:

1. satisfaction of minimal public health requirements

2. local availability of water

3. existing access road capacity

b. Criteria related to the agricultural function:

1. production of critical crops in the field

2. marketed surplus of critical crops in the RGC

3. crop storage capacity in the RGC

c. Criteria related to the non-agricultural function: [to be determined as a result of the RGC Studies]

B. Investing in the Basic Set of RGC's

1. Professor Johnson's recommendations for India

2. Other recommendations made by external parties

3. Recommendations based upon studies in Part II above

C. Evaluating the Experiments

1. Designation of control programs

2. Design and organization of a statistical service for monitoring

all RGC and control programs

3. Methods for performing an economic evaluation

2. For the present, I have nothing substantive to say about Part I: THE HISTORICAL AND POTENTIAL IMPORTANCE OF RGC'S. This should not be construed as an indication that I believe it to be superfluous. Quite the contrary. This research must be done; a solid case for RGC's must be established before anyone is going to be willing to invest in such a strategy. Being a firm believer in the division of labor, I suggest that it might be desirable to assign each of the three topics under Part I to specialists in these respective areas. Perhaps each of these three topics might be assigned as individual papers for the 1968 Summer Research Project.

3. Part II: RGC STUDIES is probably the most important part of the proposed research project. We know almost nothing about those few experiments in RGC planning which have been conducted. I have spent three months in trying simply to identify a handful of such experiments. This effort must be continued. My summer experiences strongly indicate that it cannot, for the most part, be undertaken in the U.S. The experimental sites in the LDC's, once identified, must be visited and their "planners" interviewed in depth. From the information thus obtained, the researcher(s) will then be in a position to develop formal evaluation (e.g. cost-benefit type) techniques. It is my opinion that the a priori specification of evaluation procedures is, for the most part, useless. RGC's are not "projects" at all, in the cost-benefit sense. They have multiple objectives, and their "indirect" impacts are at least as important as their direct impact on production. The closest thing I have seen to a meaningful cost-benefit study of a related program is Peter M. Landell-Mills' evaluation of Tanzanian village resettlement, which is listed in the bibliography at the end of this paper.

4. Wherever possible, the researcher(s) should attempt to compare each RGC experiment studied with some other non-central-place-oriented rural development program in the same region, or at least in the same country. Many scholars and government officials have suggested to me that the RGC strategy would be impossibly expensive, both in absolute terms and relative to the costs of other, non-central-place-oriented rural programs. This is an important hypothesis, and must be tested.

5. In Chapter Four of the instant proposal, I shall present as complete a description as possible of those few experiments on which I have been able, based in Washington, to obtain information. These are incomplete, and will have to be amplified. In the case of India, I shall also (in the same chapter) discuss the most important alternative to the RGC strategy, the Intensive Agriculture District Programme. The so-called "package programme" has had a curious history, and (as reported in documents made available to me by the Ford Foundation) constitutes an excellent example of the conflict and contrast between "pilot" and "saturation" strategies for rural development.

6. As I have indicated in the above outline, evaluation of these case studies will permit the researcher(s) to design the actual RGC experiments. That is, the information so generated will suggest what mixes of housing, infrastructure, social policy, etc. have or have not worked before. In this way, Section B.3 of Part III: A SUGGESTED RGC PLANNING STRATEGY may be formulated. Sections B.1 and B.2 should consist of quantitative evaluations of those few proposals offered by private scholars, notably Professor E. A. J. Johnson. His book (cited earlier), articles and private letters have been the principal forces responsible for the recent decision of the Indian

Government to undertake RGC-type experiments in Bihar and Uttar Pradesh in 1967/68.

7. It is with Section A of Part III of the outline that I have been especially concerned this summer: The location decision. Chapter Five of the instant proposal presents a set of sequentially employed algorithms for selecting potential RGC sites for experimentation. For no especially good reason, I have chosen to demonstrate the employment of this "location model" with data for Mali, in West Africa; the formal algorithms are contained in an appendix. Except for substitution of alternative objectives, I believe this "model" is sufficiently general to be of use in facilitating the location/selection decision in most countries. Even where structural changes in the "model" becomes necessary, it can, I think, serve usefully as a point of departure.

8. Section C of Part III of the outline calls for the design of instrumentalities for evaluating all RGC experiments attempted. Detailed, <u>continuous</u> evaluation is absolutely essential. It is pointless for social scientists to complain that data is chronically inadequate to permit scientific testing of hypotheses. We are engaged in social experimentation all over the world. These experiments are constantly generating new information; unfortunately, we do not always make provision for compiling it. The Indian IADP established facilities for evaluating the program, and these might usefully serve as a model for those who undertake the RGC research project. In particular, the Indians have designated certain rural districts not receiving attention from the IADP as "control areas". For each IADP district in a particular State, there is one designated "control district" in the same State. There is a highly desirable procedure, and ought to be built in to all RGC Experiments.

9. As to methods for performing the actual evaluations, I must refer to my earlier remarks with respect to the case studies: precise methods will have to be developed gradually as the research progresses. Insofar as the technical literature on resource allocation is concerned, the RGC is a wholly new genus. A priori models are, I believe, likely to prove woefully inadequate (and probably inaccurate as well), once the researcher(s) begin(s) to develop a "picture" of what an RGC looks like and how it functions.

CHAPTER FOUR

SURVEY OF SOME RSC—TYPE EXPERIMENTS

I. Volta River Resettlement Program (Ghana)

Background

1. In 1953, a Royal Commission under Sir Robert Jackson conducted an examination of the prospects for development of the Volta River basin in Ghana (then the Gold Coast). Included in the "Jackson Report" was a discussion of the necessity for the planned resettlement of those farmers whose lands would be flooded by the artificial lake created by a high dam.

3. Not until January 1962, did the Nkrumah government launch the project, financed (in part) by U.S.A.I.D. (see attached map). By this time, the Jackson Report had become largely obsolete; thus, an entirely new program was needed. The main dam at Akosombo was programmed to become operational in July 1964, which meant that the relocation of farmers would have to be implemented within two and one-half years.*

4. The problem was truly immense. The main dam itself, being 440 feet high and having a crest length of 2,200 feet, was to be the world's seventh largest.** As such, it would flood out an expected area of 3,275 mi.^{2} and about 80,000 people (virtually all of them farmers) living in over 700 villages.***

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* G. W. Amarteifio, "Social Welfare", in Volta River Authority, Government of Ghana, Volta Resettlement Symposium Papers, Kwame Nkrumah University, Kumasi: 23,27 March, 1965, p. 38.

** F. J. Dobson, "Introductory", Ibid., p. 1.

*** E. A. K. Kalitsi, "Organization and Economics of Resettlement," Ibid., p. 9.

In fact, after the Volta River Authority (VRA) began the resettlement campaign in August 1962, "the VRA had over 15,000 workers employed on the construction of towns and roads in connection with the [resettlement] scheme--about 3 times the numbers involved in the construction of the dam." * A crisis had developed, largely through inadequate communication among government ministries.

5. At the suggestion of several bold officials in the Ghanian Ministeries of Social Welfare and Agriculture, and with the assistance of U.N. and U.S.A.I.D. advisers, it was decided to capitalize upon the crisis--in true Hirschmannesque fashion--by using the opportunity to create that which had not existed before: a network of rural towns or "townships" based upon the scientific production of food grains and livestock, and connected by a viable transport network with one another and with the rest of the country. "Wherever possible, new settlements were planned as extensions to existing villages. In this way, settlers could benefit by being absorbed into a functioning community, and the hosts could benefit in turn from the new facilities and services which they lacked..."**

Program Design

6. In the summer of 1962, the VRA empowered a Working Party to establish a preliminary design for the resettlement scheme. Farmers in the villages and towns in the flood zone were asked to submit to the VRA lists of new towns to which they wished to migrate. These lists

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* Dobson, op. cit., pp. 7-8.

** Kalitsi, op. cit., p. 20.

were then subjected to certain economic criteria of suitability (ultimately 52 "townships" were selected as sites for resettlement). The Government would bear the cost of all aspects of the program, including housing, infrastructure, etc; the scale of the problem was, it was decided, too large to permit a self-help approach. Those farmers who did not wish to participate in the program, but preferred to relocate themselves, were to be compensated for their property at a rate equal to three times its current market value.***

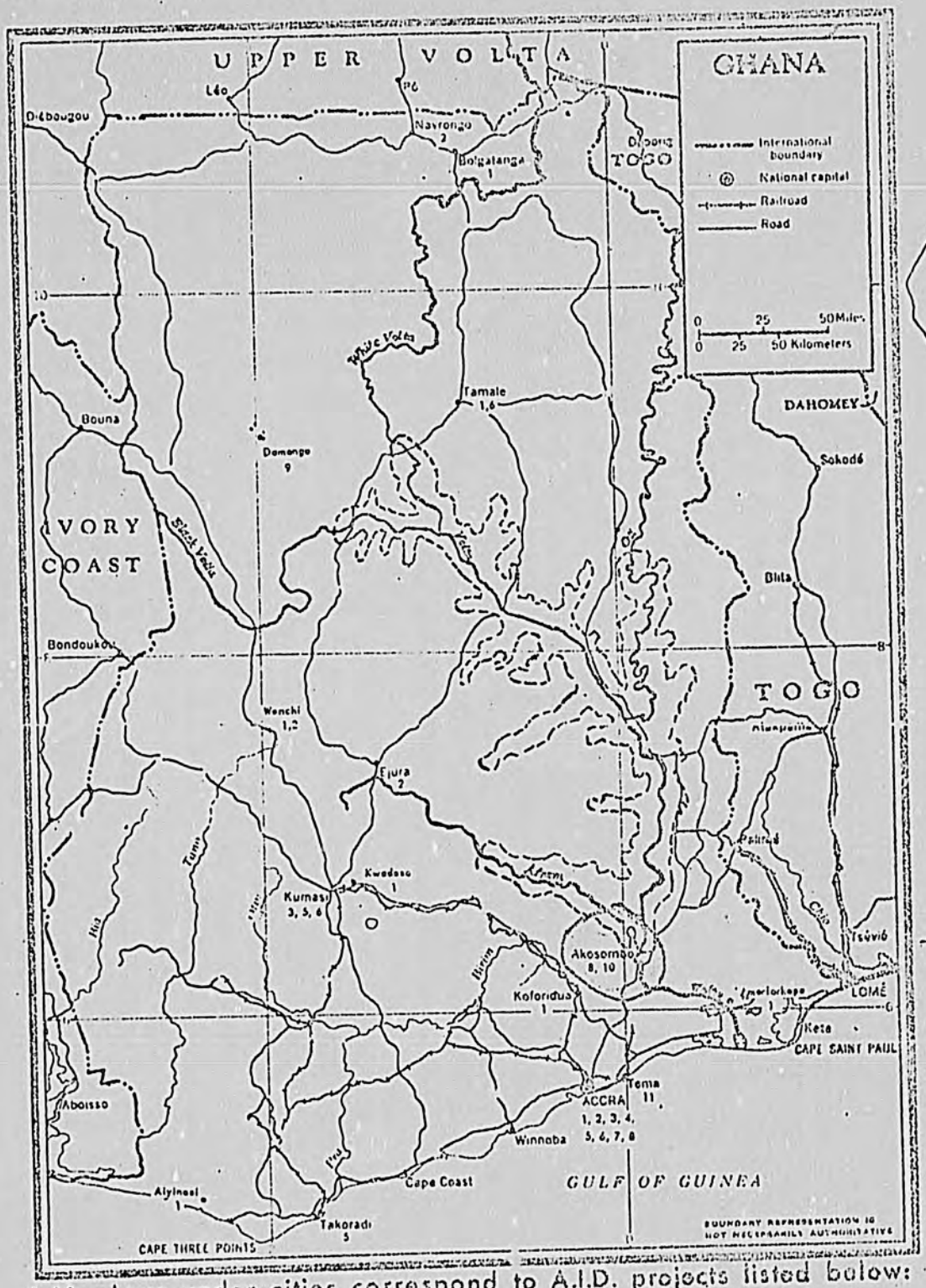
7. There were five broad criteria of desirability to which all possible sites (most of them existing towns and villages) were subjected: (1) The site had to be contiguous to an agricultural area meeting certain specifications to be described below; (2) The site had to "occupy comparatively poor agricultural land to allow the cultivation of the better land"; (3) The site had to be at a relatively higher altitude than the area immediately around it to allow free air circulation; (4) The site had to have reasonable access to the transport system; and (5) The site had to have an adequate water supply.* The water constraint was considered to be of paramount importance: "Unless water can be reasonably organized for a site, it should be abandoned. Other health points are...disease endemicity and general climactic conditions."**

*** The rate was thought to make the necessary adjustment between current value of existing housing and the current cost of reproducing that housing in another location. Kalitsi, op.cit., p. 13.

* Laszlo Huszar, Resettlement Planning, Ibid., p. 102.

** Dr. J. St. George Warmann, "Public Health Problems of Volta Resettlement", Ibid., p. 151.

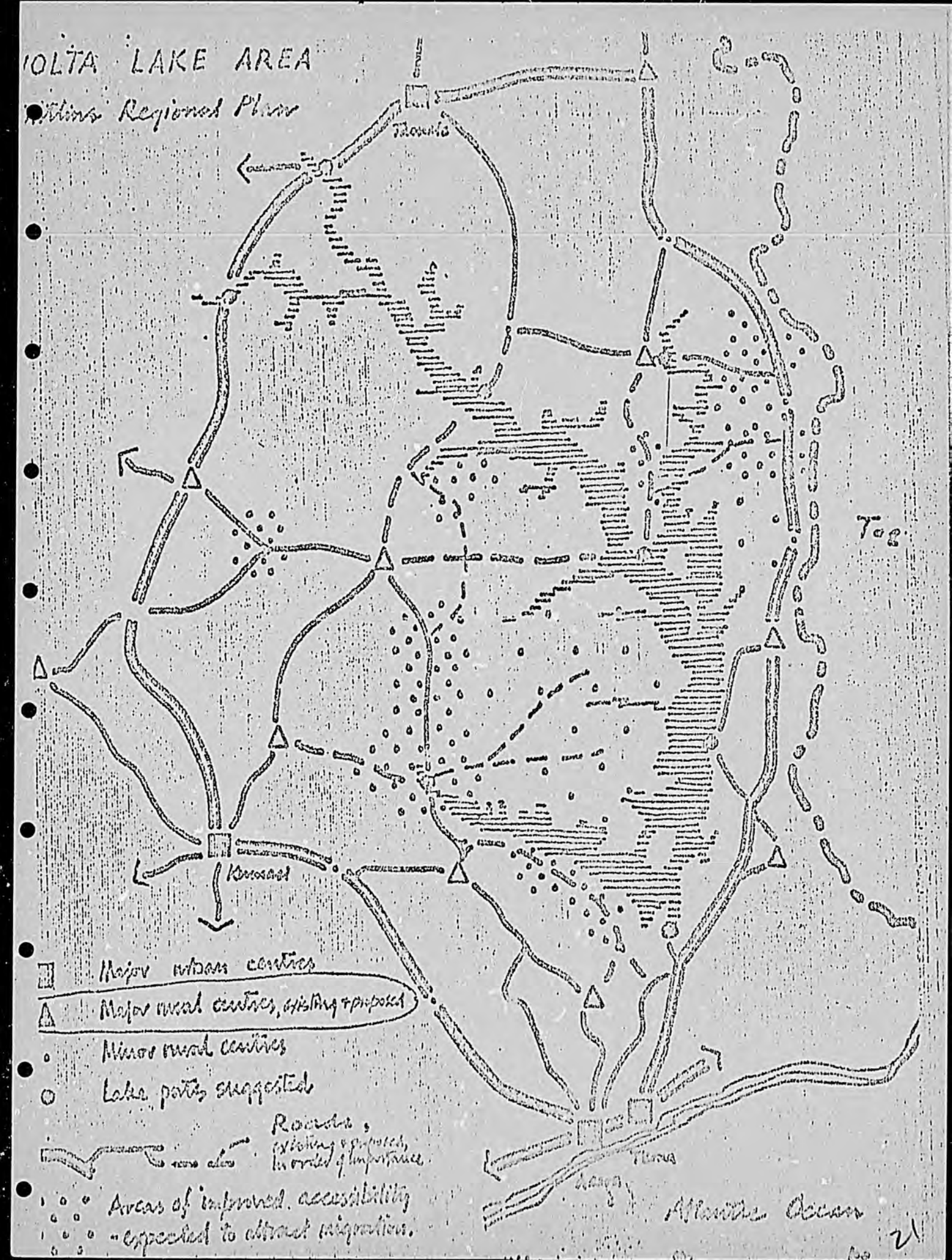
Location of USAID Project Sites in Ghana*



* Numbers under cities correspond to A.I.D. projects listed below:

1. Agricultural Extension
2. Agricultural Education
3. Land Use and Water Development
4. Health and Sanitation
5. Human Resource Development
6. Rural Public Works Development
7. National Investment Bank
8. Volta Lake Technical Assistance
9. Special Self-Help Development
10. Volta Dam
11. VALCO (Volta Aluminum Company) Smelter

VOLTA LAKE AREA
Outline Regional Plan



Professor Huszar, the chief consulting planner, stressed the transport-access constraint: "Every Ghanian villager is acutely aware of the economic value of a road-side house. It seems, in this case, the planners too were aware of it."***

8. The Division of General Agriculture in the VRA had two functions. The first, alluded to above, was to frame township site selection criteria which were, in the Division's opinion, especially relevant for the development of modernized agriculture. In particular, the Division wished to encourage the substitution of crop rotation for land rotation patterns of cultivation, and to diversify crop production, emphasizing food crops (maize, millet, sorghum), both for the settlers and to provide cheap feed for livestock--poultry, pigs and goats--for which the international demand was thought to be most substantial.*

9. The second function of the Division of General Agriculture involved "The planning and execution of an improved system of farming within the Resettlement areas or "fields" which would affect both the settlers and the existing population", within a fundamentally cooperative system.**

*** Huszar, op.cit., p. 102.

* Kalitsi, op.cit., p. 15.

** M. S. O. Nicholas, "Resettlement Agriculture", Ibid., pp. 86-87.

10. Given the resettlement site choices, there were two further considerations which the Working Party had to examine: proper scale of the resettlement towns, and the spatial-political relationship between them. With regard to the former, it is apparent that everyone concerned with the Program appreciated the possibilities for capturing scale economies through a town-centering as opposed to dispersed-village approach:

> From the beginning most people concerned with the Volta resettlement problem envisaged that the 700 or so villages and hamlets would be rebuilt in larger units. This opinion was held for two main reasons--(1) it is cheaper to build access roads to fewer rather than more settlements, and (2) with the larger farming areas envisaged, worked partly at least by machines, it is necessary to position such farms near to settlements large enough to ensure a sufficient labour force. Machine operators, service mechanics and agricultural advisors also need to be housed and fed, and this of course is simpler in a large [place] with a surplus of food beyond its immediate needs.***

11. The Working Party wished, from the beginning, to take a systems approach to the problem, and to impart a consistent spatial pattern to the resettlement scheme. They conducted comprehensive resource and land-use studies of the area, interviewed many farmers, and attempted to project the expanded transport system (including lake ferries) which might develop after the flood in 1964.* Based upon these studies, the VRA proposed a township system, consisting of (ultimately) 52 townships, each containing four different "order"

*** David Fitcher, "Social Survey", Ibid., p. 32.

* The Party also considered potential industrial land use for those activities--chiefly associated with bauxite, manganese and fish--which the dam would make possible.

central places: a Central Town (population 8-10,000), Service Centre (5-8,000), Satellite Villages (population < 5,000), and traditional village clusters or individual farms.**

11. Finally, a preliminary housing plan was drawn up. A "standard house" in each would have two rooms, cooking and sitting porches, a well, and (a mark of prestige) a corrugated aluminum roof. The towns themselves would be provided with drinking water, latrines, paved streets, cemeteries, additional schools, markets, additional crop storage capacity, and area for future expansion.***

Program Implementation

12. Many of these design targets were not implemented in their original form. Instead of the two-room houses originally planned, one-room "nuclear" homes were built. Furthermore, "The 52 resettlement townships barely conform to [the] model, but the model gave a theoretical framework against which proposals [for sites] were weighted. In this way every attempt was made to site new townships where they would benefit from the resources of an existing town and where the surrounding area would benefit from the resources of the new settlements."* Nevertheless, the actual accomplishment was certainly consistent with the program objectives: "739 old villages, ranging in size from hamlets to important market towns, and with an average population of lower than 100 [sic] are moving into 52 new townships, ranging in size from 14 to 816 houses, with an average population of 1320."**

** Kalitsi, op.cit., p. 17.

*** Kaltsi, op.cit., p. 15.

* Kalitsi, op.cit., p. 17.

13. The task of performing the valuation of existing property in the flooded area was completed by mid-1964, although few farmers chose not to accept the public choice of sites. The clearing of towns and farms began near the end of 1962. At first, communal labor was employed, organized into "workers' brigades". Despite the fact that much of this labor was indeed "surplus", this method quickly proved to be inefficient, given the 2-year time horizon. Thus the government soon began to employ heavy tractors and tree-crushers. By the end of 1964 (the flood was not to occur until 1965, due to delays in dam construction), over 6,000 acres of additional town site and over 8,000 acres of additional farmland had been cleared.***

14. The housing program began in mid-1962, employing an experimental design at Nkwakubew; by the end of the year, 100 such houses had been built. These "working models" (farmers had immediately occupied them) were studied, and then modified at the Faculty of Architecture at Kwame Nkrumah University of Science and Technology. Having now chosen a final design for mass production, the architects presented their blueprints to the VRA Engineering Department, already in charge of road-building. By the end of 1964, over 11,000 houses were completed in 44 settlements, with 275 miles of new road giving these towns some degree of access to the national transport system.*

15. By early 1965, all 52 settlements were completed. Every one of these contained: (1) septic latrines and standpipes, (2) at least one primary and middle school, and (3) market stalls with twelve bays each (public bath houses were considered but ultimately rejected as being too costly). Services installed in some of the 52 towns

*** Kalitsi, op.cit., p. 23.

* Kalitsi, op.cit., pp. 23-24.

included: (1) community centers with playing fields, (2) civic buildings (post office, police station, etc.), (3) clinics and health centers, and (4) churches. Many of these "services" were treated experimentally, i.e. constructed sequentially rather than simultaneously, to give residents a chance to respond to the planners' choices of land-use and thereby improve the degree of relevancy of further decisions.**

16. A similar experimental approach was taken with the "new" agriculture. Initially, experimental farms were set up in New Kubew, Bomoden and Vakpo, specializing in maize, sorghum, cow peas, tobacco, yams and livestock. Based on the farmers' "propensities" to adopt these crops (and the new techniques that accompanied them), the "packages" of agricultural practices were modified before being introduced into other areas. By 1964, there were a total of eight such experimental districts, all of which were serviced by centrally distributed Soviet-type "machine tractor stations" which rented approximately 500 new tractors (worth an estimated L 1-million) to the farmers.***

17. The Department of Social Welfare of the VRA is presently conducting a detailed evaluation of the program. It is particularly interested in sampling the attitudes of both resettled and "native" farmers. Quantitative indicators of the nature of the emerging socio-economic system are being developed. Such indicators had already been constructed from data collected in the now-flooded areas. Eventually,

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** Huszar, op. cit., pp. 104-105.

*** Kalitsi, op. cit., p. 24.

these two sets of indices (e.g. percentage of people within x miles of a middle school) will be compared, item by item, to evaluate whether in fact the flood crisis has been used to significantly improved levels of living in the area.*

18. We may summarize the achievements of the Volta River Resettlement Program by quoting some cost estimates made by Mr. E. A. K. Kalitsi:

> Up to the end of 1964, with 11,814 houses completed, £3,940,000 had been spent on housing and £330,000 on town latrines, schools and water supplies. In all a total of £8-million has been spent on 52 resettlements, including township construction and roads and clearing for towns and farms. Out of this, £750,000 constituted the cost of administration and surveys....In addition, the Ministry of Agriculture spent another £1½-million, of which £1-million constitutes investment in farming machinery alone. This [total] works out at about £10-million, which is about £680 per family. [By the time the project is completed in 1970, we hope that] the per-family investment figure will be about £900.**

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* Butcher, op. cit., p. 35.

** Kalitsi, op. cit., pp. 26-27.

II. Djoliba, Mali

Background

19. Between 1962 and 1966, with the assistance of U.S.A.I.D., the government of Mali undertook the planned development of a rural community, one which incorporates nearly all of the properties I have attributed to rural growth centers. The village selected for development was Djoliba, located about 45 kilometers southwest of Bamako, the capital of Mali. In 1962, the village had a population of about 1500 persons. It lies between the Niger River and the Bamako-Guinea road, "making it a natural market and distribution center". The total area of the village in 1962 was approximately 4,650 hectares, 420 of which received annual flooding from the river (see map).*

20. The Malian government had entered, in 1961, into negotiations with U.S. officials for the financing of a low-cost housing project in Bamako city itself. Shortly thereafter, the GOM Minister of Plan and Rural Economy revised the request, in light of the new Five Year Plan's emphasis on rural development. He now requested that $408,000 in counterpart funds be made available for development of "a series of model villages."** An agreement was signed on 22 February, 1962, and the first USAID technical advisor was dispatched to Mali.***

*U.S. Department of Housing and Urban Development, Division of International Affairs, Aided Self-Help in Housing Improvement, Ideas and Methods Exchange No. 18, Washington: 1967, p. 48.

**In light of the Malians' own emphasis on balanced rural growth ("the intention of the project was...to create a suitable environment for increased, diversified economic development"), it is unfortunate that the project's most important U.S. propagandist, architect Thomas B. Callaway of HUD, has chosen to emphasize the "countermagnet" function, by which he means the "creation of an improved rural-urban environment to reduce the drift to the cities". This rather misplaced emphasis has served to invite criticisms of the project, many of which are

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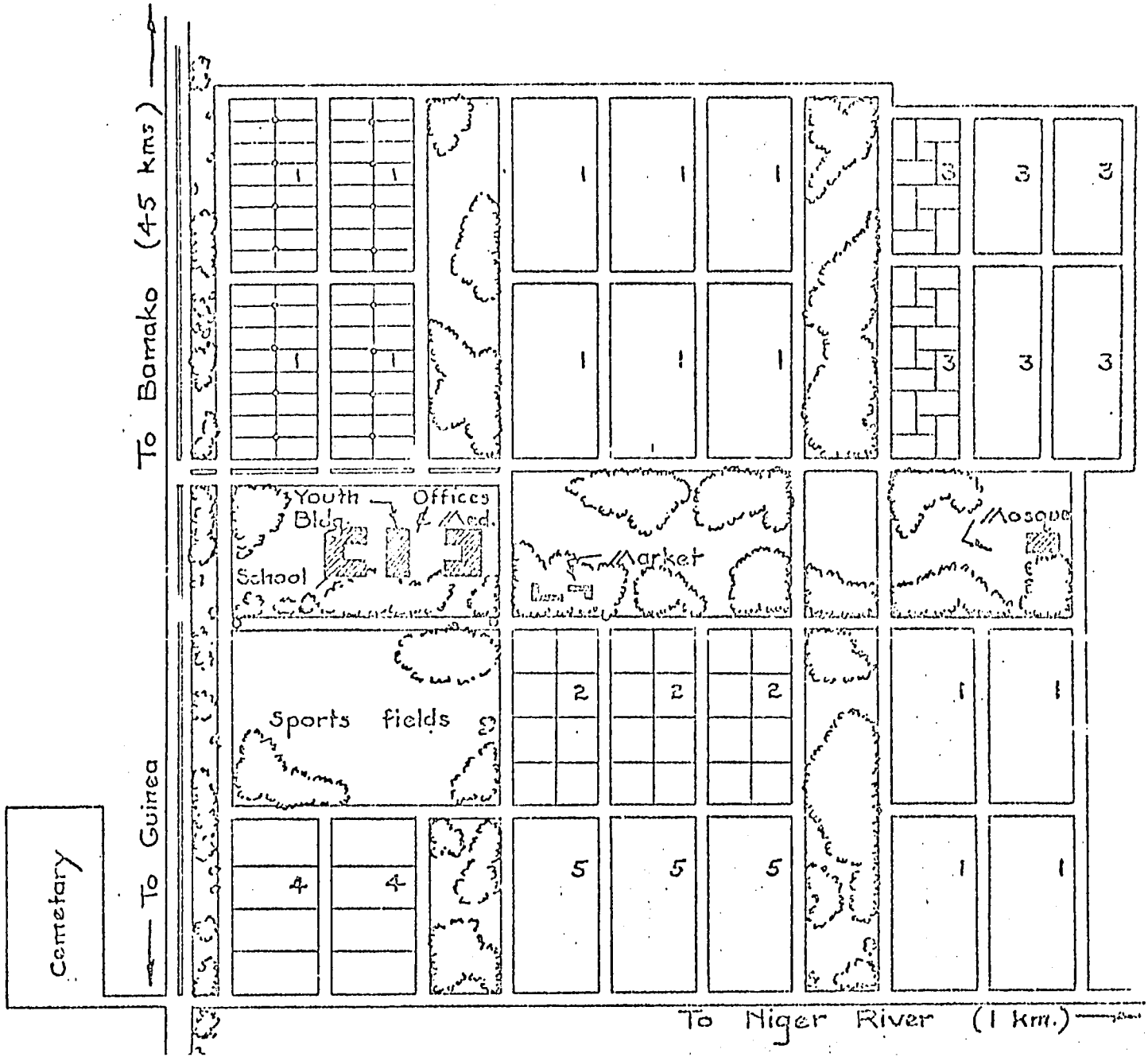
irrelevant. William Jones, for example, argues that migration to Bamako is highly rational and will not be slowed: "When Callaway was in Mali, an unskilled worker could earn at the rate of $290 in the capital....Malian GNP is estimated at $66 per head for 1964. If...90% of the people were farmers and 57% of GNP came from agriculture, then their average [rural] income was $41.80 per year. An unskilled urban migrant who could find only one day's work a week could match average [annual] farm income." See Thomas B. Callaway, "A Countermagnet to the Capital", International Development Review, Sept. 1966, and William I. Jones, "Congestion Costs and Countermagnets", IDR, June 1967. The point is that this rather typical urban-rural income gap is irrelevant; the bulk of the population must remain behind, and agriculture must continue to provide the country's economic base. Assuming that the linkages between city and village are inadequate as alleged earlier, then planning strategies for improving the productivity of investment must be addressed to the rural sector of the economy. The urban-rural dichotomy is beside the point.

*** Herman S. Davis, Chief Housing Advisor, USAID/MALI, Evolution of the USAID/MALI Village Development Program, airgram sent to AID/W; August 24, 1962, p. 2.

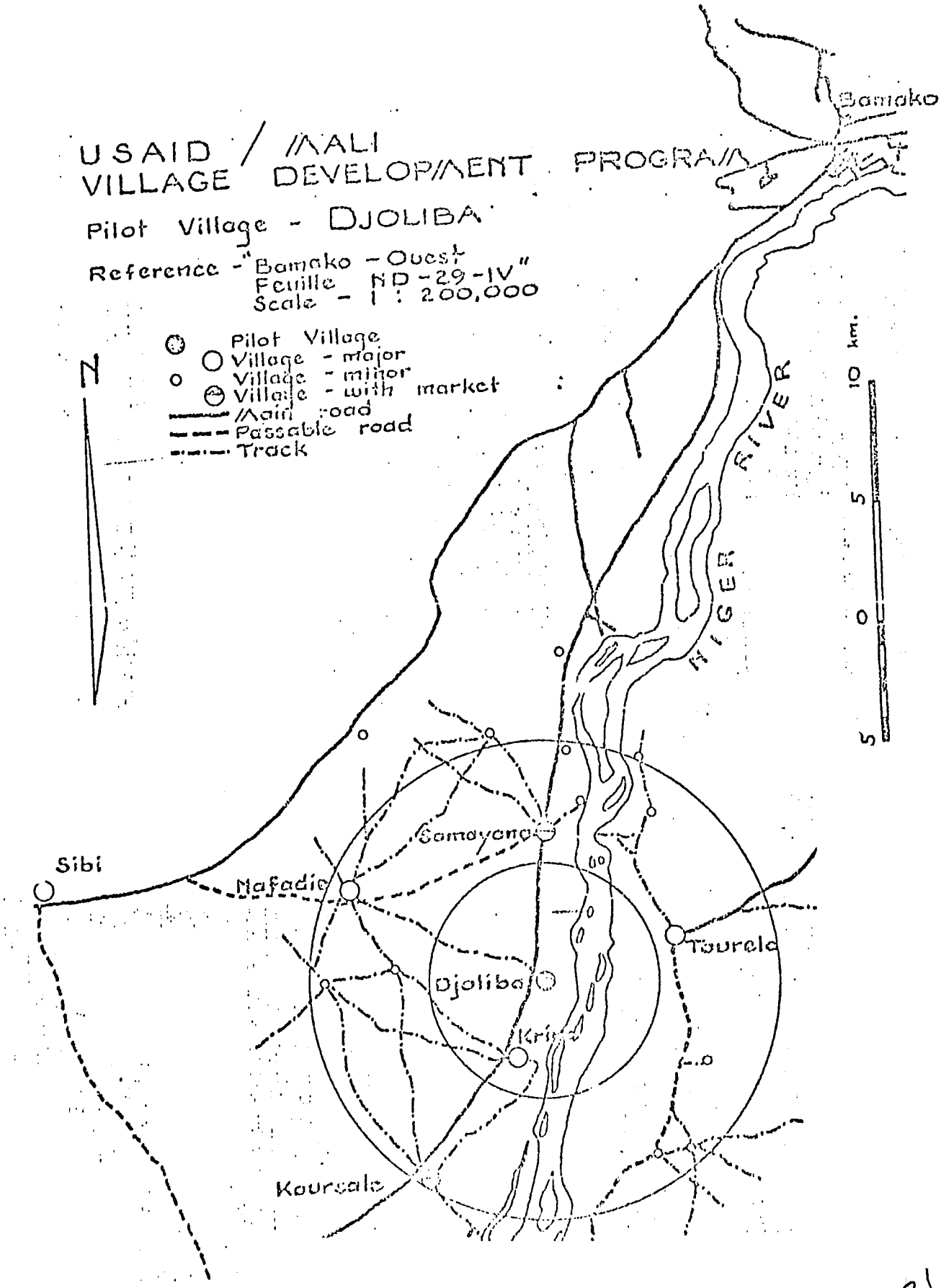


DJOLIBA PHASE I

0m. 100m. 200m. 300m.

1 Aided self help housing
2 Double lots
3 Experimental self help lots
4 Small industries
5 Future housing

1 block
16 buildings


USAID / MALI
VILLAGE DEVELOPMENT PROGRAM
Pilot Village - DJOLIBA
Reference - "Bamako - Ouest
Feuille ND-29-IV"
Scale - 1 : 200,000
Pilot Village
Village - major
Village - minor
Village - with market
Main road
Passable road
Track
N
Bamako
NIGER RIVER
10 km.
5
0
5
Sibi
Nafadie
Samayana
Djoliba
Kri
Tourela
Koursale

Program Design

20. A list of six villages, all of which were within 60 km. of Bamako, was drawn up for consideration. Although the GOM planned ultimately for "150 rural centers", it was decided to begin with a single pilot project. In order to maximize the "demonstration potential" of the pilot project on the political leadership, only villages in the vicinity of the capital were considered.*

21. The criteria which led to the selection of Djoliba were as follows: (1) Djoliba was thought to be sufficiently far away from Bamako to prevent it becoming a "dormitory", without an economic base of its own; (2) its degree of transport access was considered to be superior to that of any other candidate village; (3) being an agricultural community sustaining substantial seasonal unemployment, Djoliba would be capable of providing the labor force for "self-help" construction"; (4) within a 10 km. radius ("dix kilomètres est une distance raisonnable pour un homme à pied transportant des produits à la Communauté et retourner chez lui le même jour"), Djoliba "responded" most favorably to the question: "Combien d'individus dans les districts environnants seron touchés par le developpement d'une Communauté?"; (5) Djoliba evidenced minimally satisfactory sanitary conditions--e.g. no tsete fly, meaningful not so much because sanitation investment is expensive as because locally-engineered sanitation is an <u>indicator</u> of the attitude of the population toward environmental control and therefore an

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* Davis, <u>op. cit.</u>, p. 8

indicator of the potential for RGC success; (6) of all the candidate villages, Djoliba had the "best organized" market; (7) Djoliba had a relatively superior water supply: "Wells rapidly reflect the level of the nearby river, but the quantity available never drops to a critical point. For agricultural purposes, the type of soil in the area appears to have reasonable water holding properties, and a simple irrigation scheme is feasible over quite a wide area"; and finally (8) "Djoliba lay in the center of a productive agricultural area, and was a natural market for a dozen surrounding villages...its location near the site of the home of the ancient Mieta dynasty added to its prestige as a potential urban center".**

22. The type of investment for Djoliba receiving the greatest emphasis was housing. The AID team planned to provide housing for up to 3000 people, in 18 x 35 meter lots for each "head of household" (married male with wives and unmarried children). Each house would have three bedrooms, a kitchen and kitchen garden, granary, storage, shower and privy facilities, with space provided for cottage industries. Every four houses would share a courtyard, with a centrally placed well ("the favorite gossip center for area wives"). Special areas would be provided for those citizens wishing and able to build their own homes. Thatch roofs were planned, for lower cost and better ventilation (although subsequently, the native demand for corrugated metal roofing became too powerful to ignore).***

**U.S.A.I.D./MALI, Village Development Program, a report on Djoliba prepared by Housing Advisor Thomas B. Callaway, for the period 7/22/62 - 1/22/63, Bamako: 1963. U.S. Department of Housing and Urban Development, Division of International affairs, Aided Self-Help Housing in Africa, Ideas & Methods Exchange No.65, Washington: 1967, pp. 25-27. Callaway, op.cit., p. 19.

***Callaway, op.cit., p.20. HUD, Africa, op.cit., p.41.

23. The team consulted with local farmers, experts from the GOM experimental farm near Bamako, and with USAID specialists. This information led to the construction of a master plan for agriculture. The villagers were advised to cultivate a new crop, the congo bean, and to substitute from rice into millet and corn. Poultry production was also emphasized. Finally, to help supply the inputs for a tomato processing plant in Bamako, thereby substituting for a leading import item, Djoliba was advised to increase its output of tomatoes.

24. To complement these purely agricultural recommendations, the team drew up plans for the development of local agro-industry. Flour mills for processing the local millet and corn were suggested, as was an oil pressing mill for processing one of the area's most ubiquitous crops, peanuts. Furthermore, the by-products of each of these two processes would produce a highly effective feed for local livestock. Eight sites for these activities (and for others of a non-agricultural nature) were laid out beyond the residential area, to be linked both to the Niger and to the Bamako-Guinea road by an access road.*

25. Although the actual housing construction began in late 1962, one of the most potentially important aspects of the program was not "planned" until September 1963, when a U.S. technical consultant on industry development came to Djoliba and recommended the construction of a Small Industries Training Institute. This would consist of the machine shops needed to manufacture the grain and oil pressing mills, and would provide facilities for housing and training young Malians in all the

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*Callaway, op. cit., p. 19.

crafts necessary to permit replication of the Djoliba model village elsewhere in the country.**

Program Implementation

26. By the middle of 1965, 62 housing units had been constructed in Djoliba.*** All construction was "self-help", employing "400 people (working 100 per day in rotation to allow farming operations to continue").* Approximate average construction costs per dwelling were:

Masons	$101.30
Grader	8.80
Transportation	5.40
Wood	52.70
Corrugated roofing	213.34
Cement	154.30
Stakes	3.50
Tool rentals	2.70
Miscellaneous	7.00
	$549.04

Eighteen masons were hired from outside the village to train local apprentices. Few of the latter, however, were forthcoming; ultimately fourteen Djolibans received training in masonry. Another miscalculation on the part of the AID planners consisted of the decision to use a mechanical grader. Experience indicated that local labor could easily have been substituted for this capitol import from Bamako. The third major error in judgment lay in the decision to use cement as a basic building component. Lime, ubiquitously available in Mali, could easily have been substituted for cement, which had to be imported into the country.**

**letter from Herman S. Davis, Housing Advisor, to Dr. Samuel C. Adams Jr., Housing Director, AID/W, dated 22 October, 1963, p. 12.

***L'Essor: Organe de l'Union Soudanaise - R.D.A., lundi 14, juin, 1965, p. 4.
*Callaway, op. cit., p. 20.
**AID/MALI, op.cit. Also private communications from Callaway and AID/MALI, summer, 1967.

27. By 1965, about 25 capped tubewells, 30 sanitary pits, and 5 kilometers of drainage ditches had been completed.*** I have not been able to find records of project achievements in terms of road mileage added, but Callaway reports unofficially that, as of 1 January, 1963, programs had been started for improving existing roads, linking the (then future) agro-industrial "park" to the national road and to the river, and for providing the rudiments of a river transport system.* Other infrastructure included a steel-framed marketing building (1964), a maternity center (1963) and additional schoolroom capacity (1963-64).**

28. The small industries training center was build in 1964/65. It contains classrooms, a tool store, office and work shops, and housing for instructors, officials and guests, with a central unit containing kitchen and privy facilities.*** By the summer of 1966, there were fifty eight students in residence, studying carpentry, masonry, blacksmithing, mechanics and electricity. This class--and its successors--will become the "cadres" who will travel to the other regions of Mali in order to build other growth centers.*

Program Evaluation

29. It has been said that "The cost of the Djoliba project was considerable, especially when compared to the new production it stimulated."** I have been able to make some estimates which do not reject (implied) this hypothesis.

***Phil Oviatt, AID/MALI, end-of-tour report, 1965.

*private communication, summer 1967.

**Callaway, op.cit., p. 20.

***Oviatt, op.cit.

*IBRD, Africa, op.cit.

**Jones, op.cit., p. 43.

The total real U.S. cost (assuming a zero opportunity cost of the self-help labor used), from 1 February, 1962 through 30 June, 1966, was $480,210.*** The GOM provided office space for AID and local technicians, and wages and salaries for the few Malian counterparts of the AID staff. While no figures are available on these items, $14,000 is, if anything, an extravagant estimate.* I have checked with associates in the International Monetary Fund whose records do not indicate any significant contribution to the Djoliba project from the EEC, IBRD, or any other lending/donor agency.

30. There has been an insufficient lapse of time to conduct a fair test of the direct impact of the project on local production, but a few figures may be indicative of some of the short-run results:**

	Output (in metric tons)		
Crop	1962/63	1963/64	1964/65
Millet	121	148	300
Peanuts	15	41	80
Rice	78	50	25

Especially note that the sharp increase in millet production and parallel decrease in the production of rice reflect the agricultural "master plan" recommendations (of course we have no way of knowing from this data whether

***"Village Development" Implementation Orders, AID/AFR/WA desk, Washington, courtesy of Mr. Jerry Knoll.

*Jones estimates 1962 per capita income for primary school graduates residing in the capital at $1100 ("For those who could find work"); see Jones, op.cit. p.42. If 3 local counterpart technicians were employed for the full 4 years on the project, their collective wage bill would have been $13,200. Assuming that the opportunity cost of office space for 6 men for 4 years is $800, then the total equals the figure in the text.

**L'Essor, 14 juin, 1965, p. 4

these trends in fact represent substitution of millet for rice). At a 1965 domestic (cooperative) millet price of about $1,040 per metric ton,*** if only 100 of the incremental millet tonnage may be said to have been induced by the project, then this benefit equals $10,400. If, of the 58 students presently enrolled at the small industries training center, only four become fully operative, then the technical assistance cost to Mali of replicating Djoliba is reduced by the wage bill of four foreign advisors, less wages for the Malians. The average annual wage bill for the USAID team was $51,750. Using Jones' figure of $1,100 x 4 = $4,400, the net saving equals $47,350. Assuming no further increases in millet production, and continuous employment of the newly trained village construction technicians gua technicians, then these two sources combined may contribute $57,750 worth of annual benefits (gross of farmers' incremental production costs and the costs of actually training and equipping the technicians). If no other costs or benefits accrue, then, at a 6% rate of discount, gross benefits would just equal the $494,210 cost of Djoliba in about fifteen years, a calculation which does not reject Jones' hypothesis. However, let me reiterate that it is really unfair to attempt to measure the project's impact only one year after its completion, especially from such scanty data, and to the exclusion of non-efficiency benefits (remember that

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*** 260 Malian francs per kilogram equals 260,000 Malian francs per metric ton at 250 Malian francs per $1 equals $1,040.

the creation of new housing was only partially intended to be an instrument for inducing economic growth)*.

32. My discussions with private scholars, World Bank and AID personnel, and perusal of communications from Amembassy BAMAKO to AID/W, indicate that no attempt has been made by the GOM to locate public enterprises (or to induce the location of private enterprises) in or near Djoliba. Every new directly productive activity introduced in the last three years has been located either in Bamako city or in the semiantarchic Office du Niger in central Mali, despite the fact that "perhaps as many as 95 Malians out of 100 continue to live in small rural groupings only partly touched by the money economy." **

33. One new and potentially important service activity has been recently located in Djoliba. On 17 March 1967, a small vocational school began operations. Built and operated by a team of Northern Vietnamese technicians, the school is designed to train instructors who will establish handicrafts shops throughout the country. This idea had originally been suggested by the AID team. Currently, 23 Malian students are enrolled at the school.***

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* Moreover, with respect to Jones' argument that "viability of the project depends on the increase in production generated, the number of jobs created, and the new kinds of production inspired by the expenditures," we have no figures at all pertaining to employment creation and product innovation. See Jones, op. cit., page 43.

** Background Notes:Mali, U.S. Dept. of State, Pub. 8056, Apr. 1966, P.3.

*** L'Essor, 17 Mars, 1967.

III. Attempts to Introduce a Central-Place-Oriented Agricultural Planning Strategy in India

Etawah

34. From 1946 to 1953, under the direction of Albert Mayer, a New York architect and planner, the government of India engaged in the experimental development of Etawah district in the State of Uttar Pradesh. Rather than concentrate on individual market towns, Mayer formulated a concept of "village clusters", small groups of villages clustered around a central market town or village.* Mayer argued that "Government assistance... should be poured without stint into a few high-priority projects in order to insure their success. The surrounding regions in turn would benefit through the radiation of advanced agricultural techniques which had shown their worth in the project areas."**

35. Mayer developed, as early as August, 1946, a comprehensive "picture" of what his "village clusters" ought to contain:

> "We will want to provide as far as possible: (i) Better housing, in physical space, arrangement, quality, and permanence. (ii) Intercommunicating system of simple but all-weather roads to some center for regular reliable disposal of produce. (iii) Sanitation--personal hygiene, sewage disposal, drainage. (iv) Water supply and distribution. (v) Mosquito and malaria control. (vi) Maximum local irrigation obtainable....(vii) Dispensary, clinics, hospital. (viii) School or schools. (ix) Community house and recreation center....(x) Meetinghouse....(xi) Warehouse....(xii) Possibly small buildings for small machines, looms, and so on.... possibly also for central storage of cooperatively used farm implements.***

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* At a conference on Indian Urban problems held at Berkeley in 1960, Mayer described his concept as "the development of 'central villages' as centers of village clusters, with a continuing element of agriculture or animal husbandry, but with the particular objective of setting up certain types of small industry..." See Roy F. Turner (ed.), India's Urban Future, Berkeley: 1960, p. 400.

** Daniel Thorner, "Dropping the Pilot: A Review", Economic Development and Cultural Change, April, 1959, p. 378.

*** Albert Mayer and Associates, Pilot Project, India, Berkeley: 1958, p. 10.

40

He urged the planners to "use locally available materials to the maximum, to use local labor by the people themselves (in what I believe is their ample spare time) so as to reduce cost"*--thus advocating a "self-help" strategy 15 years before the term was invented.

36. The facilities located in the "village clusters" would not be employed efficiently, if at all, unless certain complementary activities were undertaken simultaneously: "(a) Education and information in the use of these facilities...(b) Some skilled personnel must be provided, initially from the outside, to operate certain facilities, and to keep them in proper repair...(c) Improved agricultural practices..."**

37. In the final proposal, three points are of particular interest. First, Mayer asked that the basic unit, the "village cluster", be treated "not merely as an administrative unit, but as a social and community center as well."*** Secondly, he emphasized that "the methods developed [for the pilot project] must be reproducible elsewhere, without excessive costs, or other excessive special requirements."* Finally, he advocated inclusion on the planning team of what he called a "Rural Life Analyst...who should be trained and experienced rural sociologist [and] whose role will be that of analyzing the human relations structure as it is before the development program is launched, and the changes

*Mayor, Ibid.

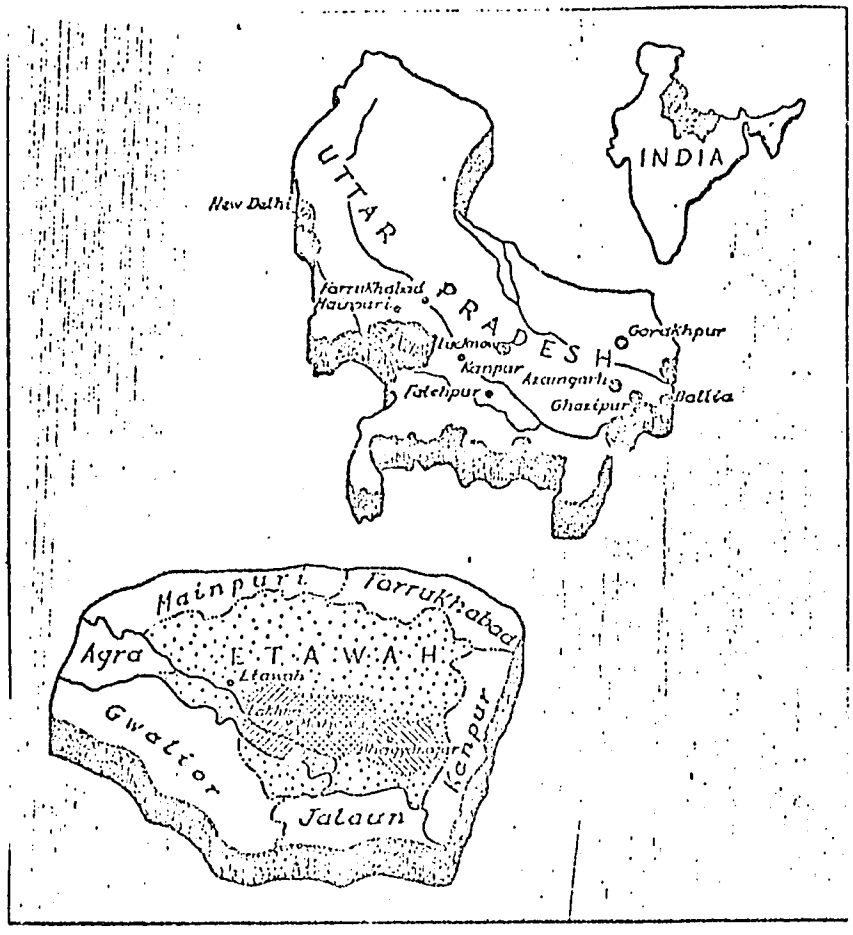
**Mayer, Ibid. p. 11.

***Mayer, p. 25.

*Mayer, p. 33.

that occur as the program is carried forward."**

38. Initially, a single pilot project site was chosen. Etawah district in Uttar Pradesh was selected (see map below) from a set of seven candidate sites, by



several rather vague criteria (see Mayer, pp. 40-41). Later, "In order to test techniques in a variety of different situations, pilot projects were set up in five districts."***

**Mayer, p. 32.

***Mayer, p. 39.

39. "Unfortunately, no base-line survey was ever made at Etawah, and no statistics were kept for a comparable control area not subject to intensive revitalization activities. No estimate is provided [in the Mayer book] of the investment in terms of money, time, and trained personnel."* We do, however, have some of Mayer's own estimates on project outputs.

40. Agricultural activity allegedly induced by the Etawah program is shown in the following diagram and in a letter (reproduced below) from Mayer to (then) U. P. Premier Pant:

*Thorner, op.cit. This is not quite true; McKim Marriott reminds us that Mayer estimated the annual cost, "once begun", at about Rs. 350,000, of which about 60% was spent on agriculture. Furthermore, "Productive return to the villagers on governmental expenditure at Etawah each year is believed to vary between 6:1 and 12:1." See Marriott, "Replies from the Pilot House", Economic Development and Cultural Change, April 1959, p. 381.

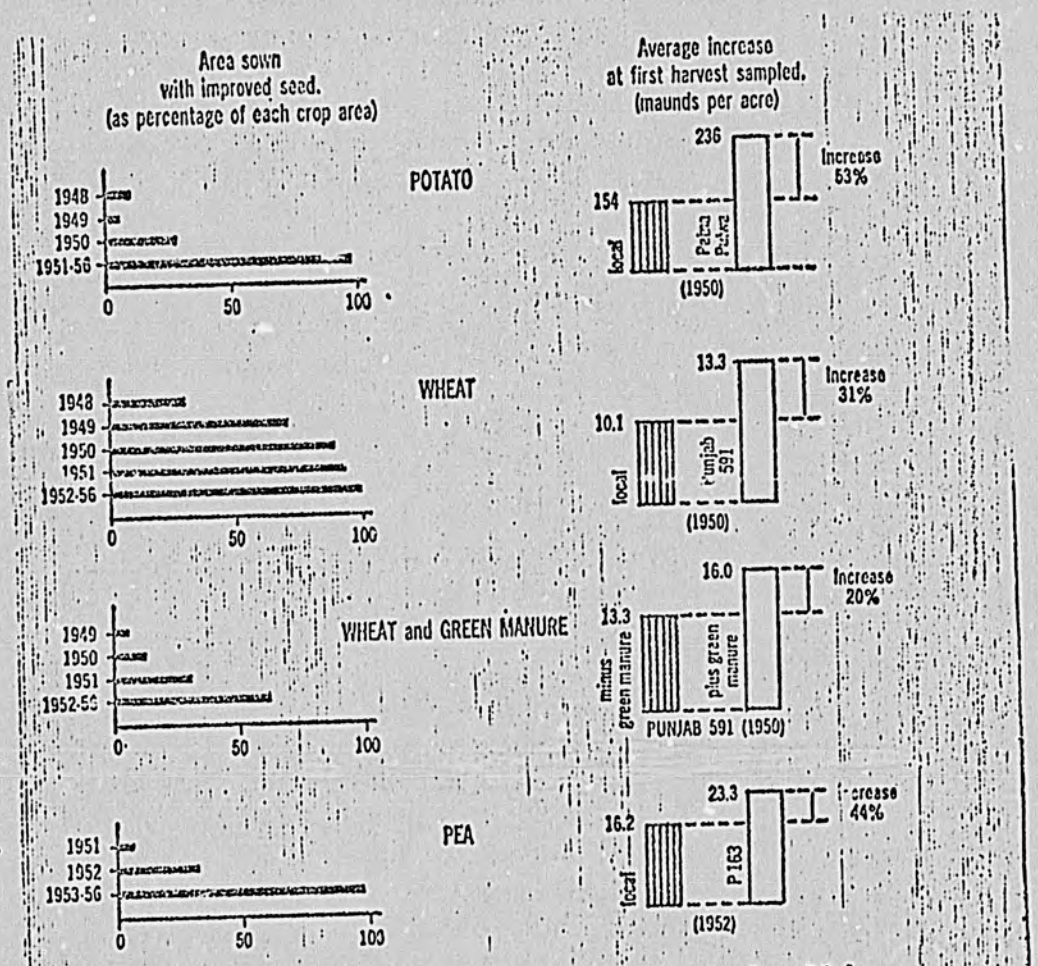


CHART 3. *Improvement in winter crops, Etawah pilot project, Mahewa block, 1948–1956.*

Re: Direct Economic Return from Pilot and Community Projects: Results in Etawah

DEAR PREMIER PANT,

I have just come back from Etawah, on my final swing before leaving India. I wanted to reanalyze certain problems there.

In the course of my stay, I looked over figures of increased production in the last few years. They are so simple and striking that I think you will want to know about them. The figures I am about to quote concern increased value of production of just three crops in our two-block area.

1. *In 1951–2*, increased production of wheat and potatoes only as measured against the local variety, with the area practically saturated with pure wheat Punjab 591, and with green manuring having become fairly popularized, measured in money at market prices came to:

Wheat	Rs.1,060,900
Potato	272,880
	Rs.1,333,780 [15]

2. *In 1952–53*, the winter crop just harvested, our crop-cutting experiments show yields higher than these, but as the rains had been exceptionally favorable, it would not be fair to calculate the actual higher gains. Also there is no local variety that we could measure against, as the areas are practically saturated. Hence I will take the same gain for this year as noted above.

However, in this year, we must add another crop where a new pure seed was introduced on a considerable scale. Pea 163 had been introduced demonstrationally in 1951–52. The results were very convincing. In fact we figured a gain of some Rs.16,000 in produce on these demonstration plots. But in the figures above I have omitted this small sum. There are also minor increases in barley and gram, but I have preferred to omit these relatively minor items.

[15] These figures are taken from the U.P. Government publication, *Agragami vikas yojna Etawah ka sankshipt* (Lucknow, n.d., [1953]).

However, in that year we multiplied pure seed so that we were able to plant 2,000 acres in 1952 with this pure improved Pea 163. The results were splendid: increased average production over the area was 10 maunds per acre (i.e., total of 20,000 mds.); and, due to the far better grain quality, the market price was 2.4 seers per rupee as compared with 3.4 seers for the local variety. Taking these two factors together:

Increase of 10 mds. per acre over 2,000 acres at Rs.17/- per md.	Rs.340,000
Difference in market price: 20 mds. × 2,000 acres at Rs.5/- per md.	200,000
Total gain from pea	Rs.540,000

Thus the increased income for 1952–53 due to wheat, potato, and pea is:

Wheat, potato (same as above, saturation)	Rs.1,333,780
Pea (2,000 acres)	540,000
Total	Rs.1,873,780

3. *Pure seed propagation.*—In addition, we have been able to propagate and realize large quantities of pure seed in wheat and pea, so that, after the initial splendid help of the Agriculture Department, we have been able to reciprocate by producing enough pure seed not only to meet our requirements, but to supply the remainder of Etawah district, and help some other districts as well.

4. *1953–54 prognosis.*—I am dealing with this again in terms of these two winter crops and potato.

In wheat we have introduced this year (1952–53) two promising strains, Punjab 710 and 720, on a demonstration basis. It is too early to say whether these will prove still better yielders than Punjab 591. However, I mention this as indicating a likely possibility, also as indicating that we are not remaining static or complacent, but are still adventuring, and finally as indicating that our potential increases are by no means at an end if we continue to work alertly.

Therefore in the economic prognosis I will use the same figures as before for wheat and potato—comparing their yields with the basic yields of the local varieties that prevailed when we took over.

In pea we have now enough pure seed to saturate the whole pea-growing area in our 236 villages—a little over 11,000 acres. Assuming we cover only 10,000 acres, and that the increased yield per acre over this much larger acreage is less—let us take 8 maunds per acre instead of 10 maunds as the increase—we will have:

Increase of 8 mds. × 10,000 acres × Rs.17/- per md.	Rs.1,360,000
Difference in market price: 20 mds. × 10,000 acres × Rs.5/- per md.	1,000,000
Total gain from pea forecast for 1953–54	Rs.2,360,000

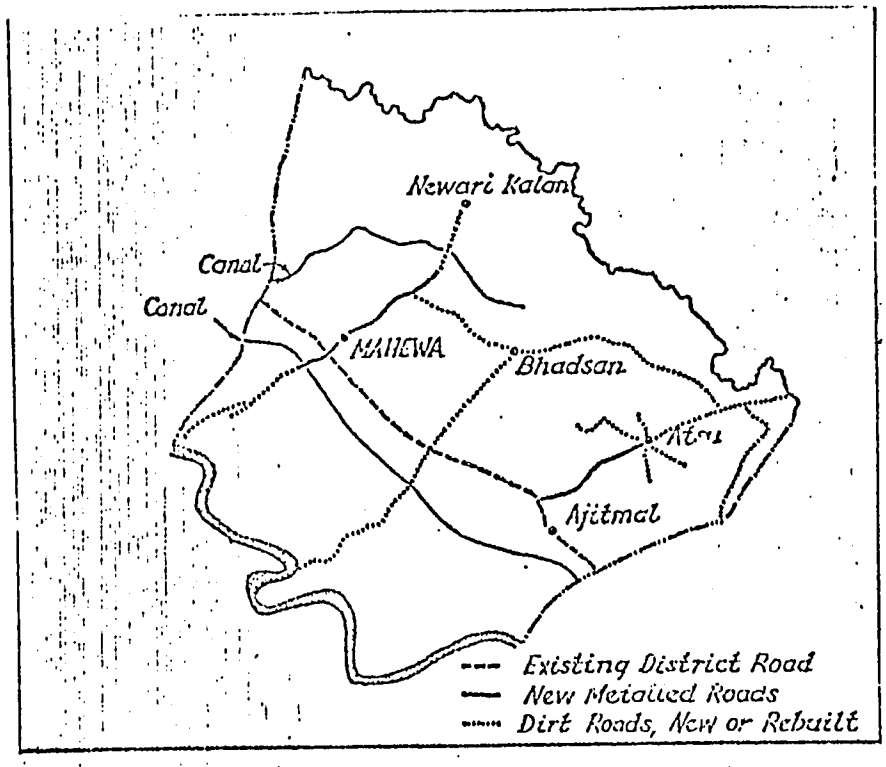
Adding this amount to the gain in wheat and potato that has been assumed as fairly constant at around Rs.1,334,000, we can anticipate a total gain in 1953–54 of something like 35 lakhs of rupees, on present market prices, and assuming no drought.

5. *Increase in tons of food production.*—For the purposes of certain conclusions to be drawn below, I have figured this all in money. But the increased quantity of food itself, the real increase, is tremendously important and significant. Money is only an index. This increase as of 1952–53 is of the order of 2,000 tons of wheat, and about 600 tons in pea. From the prognosis for 1953–54, it should be about 2,000 tons of wheat, and about 3,000 tons of pea.

6. *Some conclusions.*—The one I want to emphasize here is "return" on government investment. It has often been noted before, but is now seen to be continuingly and increasingly true that government investment in intensive rural development work is paid for over and over again in tangible economic return. This tangible return must be added, of course, to the important and indispensable intangibles which make this improvement possible and are the guarantee of its "built-in" continuity and permanence. The return to the cultivators has every year been much greater than cost to government. In 1952–53 it was something like six times as much. In 1953–54 it should be of the order of ten to twelve times as much.[10]

[10] Owing to an unanticipated fall in prices, this estimated ratio was reduced in 1953–54 from twelve to about nine or ten times the expenditure. Although return ratios are always subject to such market fluctuations, a return ranging from six to twelve times the annual governmental expenditure is likely to be maintained in most years. To such estimates, based on major crops only, must be added the pilot project's general improvement of productivity through extension of cultivated area and promotion of better manuring and cultivating practices.

41. Achievements in construction of roads are shown below.



42. One of the program's principal objectives was to increase the demand for manufactured farm implements, thus (hopefully) improving agricultural productivity and inducing the development of rural-based agro-industry. Mayer, in describing the project's success in this respect, tells a story of the adoption of the Olpad thresher:

> At the wheat harvest in March, 1949, the Olpad thresher was reintroduced and demonstrated to the farmers of Etawah. It proved remarkably attractive, since it could produce in two to four days the amount of threshed grain and straw which bullocks took six to ten days to trample out by the age-old method that was then still current. The thresher's quicker work also reduced the danger that early spring rains might catch the grain still exposed on the outdoor threshing floors. The bullock-days thus saved from threshing could be applied to plowing during the hot weather from April to June before the rains, one of the cultural practices that would further improve crop production during the summer season.

But the original cost of the Olpad thresher as sold by an urban manufacturer was Rs.180/- (about $38). This was far too expensive for most cultivators, whose average annual cash income may not reach Rs.1,500/- (about $315). Plans were therefore made for renting the machines. In 1950, before the threshing season in the spring, the Etawah project had acquired eight Olpad threshers, while the local cooperative unions had acquired six. Those were all rented out continuously during the threshing season at Rs.1/- per day. Such a rental scheme proved to be both advantageous to the cultivators and an economic proposition for the cooperative unions.

At the 1951 harvest, the eight Olpad threshers belonging to the project and the ten belonging to the cooperative unions together earned a rent of more than Rs.700/- and handled the wheat crops of an estimated 350 acres. The same eighteen machines were used twice as extensively in 1952, earning nearly twice the previous rental, while sixteen new threshers, purchased by individuals privately, were also brought into use. Acreages covered, rentals earned, and numbers of machines purchased rose steadily year after year. In 1956, an estimated 200 Olpad threshers were in operation, handling 10 to 15 per cent of the entire acreage under wheat in the Mahewa block of villages.

As the demand for Olpad threshers grew, production increased and prices were reduced somewhat. But demand in the project area was such that urban manufacturers several times failed to deliver enough machines in time for the threshing season. This difficulty of supply led to the setting up by local blacksmiths of several small rural manufacturing enterprises at Mahewa village. The Mahewa blacksmiths soon began selling for Rs.145/- the thresher that the city manufacturer sold for Rs.165/-.**

Ultimately, "the Mahewa Cooperative Union joined with these...blacksmiths in 1955 to form a more efficient rural manufacturing plant. About sixty Olpad threshers and a large number of hand hoes were produced in that year", as well as a cooperative brick industry which "has become...important... in its subsequent rapid

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**Mayer, pp.250-251.

expansion over the whole state, and in its implications for other rural industries."*** In this connection, Mayer points out that "Sales of improved implements in the project area at Etawah have not yet [1956] topped what appears to be the full potential demand...If [this] can be fulfilled, not only will agricultural production be further improved, but industrial employment will be favorably affected. In the West, the big push in popularizing improved implements came at first from the salesman of the implements manufacturer. Almost nothing along these lines has been done in India."*

43. Etawah was intended to be a prototype for rural planning on a country-wide scale. However, "subsequent village reconstruction work [implemented as the Community Development Program of the 1950's] departed sharply from the techniques on which [Mayer] banked most heavily. Firstly, the Government of India shifted from intensive activity in small areas to 'thin' rapid coverage of the whole country through a National Extension Service."** The causes of this major shift of policy from a central-place to a geographically-dispersed strategy have never been identified.

The Ford Foundation and the Intensive Agricultural District Programme

44. The Indian Community Development Program of the 1950's abandoned the "village cluster" central-place approach advocated by Mayer in favor of a strategy of distributing scant resources--

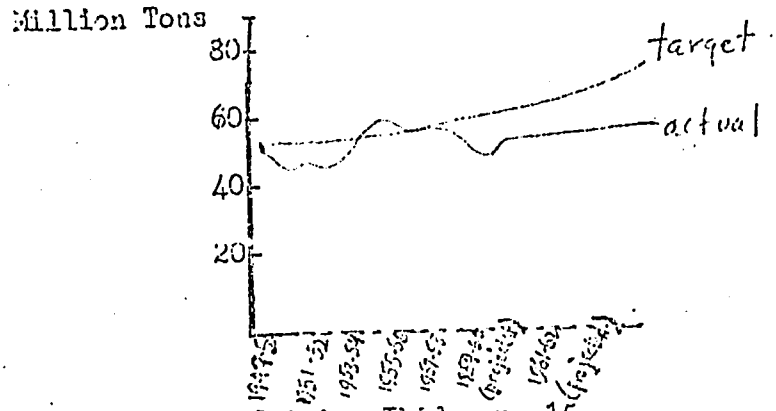
*** Mayer, pp. 271-272.

* Mayer, p. 253.

** Thorner, op. cit.

principally irrigation and totally inadequate extension services--over the entire country. By 1959, the overall impact of the Program was, as might have been expected, negligible; "Community Development in India is not a programme at all, it is rather a generalized statement of aspirations."*** The gap between minimal domestic food requirements and production had grown (see chart below), and efforts at monetizing

PRODUCTION OF FOODGRAINS IN INDIA



Source: Food Crisis, Ibid., p. 15.

the rural sector, especially through increased marketing activity, were almost completely unsuccessful.*

45. In 1959, a Ford Foundation team went to India at the request of the GOI to assess the problem and to make recommendations for revising the existing rural development strategy. Among their general recommendations were the introduction of guaranteed minimum prices to farmers, a labor-

***Ford Foundation Agricultural Production Team, Report on India's Food Crisis and Steps to Meet It, GOI Ministries of Food & Agriculture, and Community Development and Cooperation, New Delhi: April 1959, p. 107.

*"By far the largest portion--over 75 percent--of India's foodgrain production is never marketed". FOOD CRISIS, Ibid., p. 98.

intensive rural public works program, increased production, importing and distribution of chemical fertilizers, intensive irrigation and land reclamation, increased emphasis on wheat, rice and hybrid maize, and further development of State cooperatives.**

46. But by far the most important area of interest to the Ford team was rural marketing. The "Food Crisis Report" (and the members of the team with whom I've had an opportunity to speak) repeatedly emphasize the inadequacy of Indian marketing facilities, both as transmittors of farm products to the cities and as transmittors of manufactured inputs to the farmers. Thus, the Report asserts that the two most important conditions for achieving some degree of farm price stability are "A market within bullock-cart distance that will pay the guaranteed price when the cultivator has to sell" and "suitable local storage facilities".***

On the factor-supply side:

> We have been impressed with the ever-recurring problem of how to get the needed supplies [of inputs] to the cultivator at the time they were required, and in the variety and the quality recommended by the [planning] staff, and within a bullock-cart haul distance of the cultivator.
>
> We find that much of the time of the [GOI agricultural] staff at all levels...is taken up with the organizational problem of getting the supplies out to the cultivators.*

47. The strategy advocated by the Ford team for employing the recommended instruments and instituting the necessary reforms recalls Albert Mayer's original approach. They advocated small-scale

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**FOOD CRISIS, Ibid., pp. 4-5.

***Ibid.

*FOOD CRISIS, Ibid., pp. 87-89.

intensive experiments in rural planning:

> We suggest that each State undertake...an experiment with a core staff...serving approximately five contiguous villages. The productive potential of the villages selected should be moderately high....
>
> The five-village area is suggested because it is believed that...in most cases the five villages would provide opportunities for efficient cooperative activities in credit, farm supplies, marketing and local processing. If it were found that a larger number of villages were needed to [achieve such economies of scale], more than five villages could be used in the experimental unit....
>
> One of the first major steps that should be taken is to record and analyze existing conditions and plan changes that might be made to increase food production economically....
>
> To the extent of their ability, villagers should be involved in this [preliminary] analysis....
>
> The [resulting] programme should be carried out by the villagers under the direction of the core staff. Such a programme should have optimum resources at its disposal....
>
> An appropriate part of the experiment could be the development of, say, one of the villages as the "seed multiplication village". This selected village could serve as the primary source of Certified seed for the other villages in the group....
>
> Needed resources such as credit, irrigation facilities, fertilizer, seed, insecticide and equipment should be made available to the project. Existing procedures and regulations should be changed if necessary to facilitate carrying out the programme.
>
> Because of the need for major changes, and the experimental nature of the project, an agreement should be reached with the cultivators to guarantee them against losses resulting from adoptions of the new ways of farming....
>
> If these projects are to provide the data upon which to make...decisions, they must be accompanied by adequate data gathering to analysis. Benchmarks should be taken before the experiments begin, in order to measure such things as the level of production in the villages, the attitudes of the people and the practices being used. The experiments must be studied in process to determine the important ingredients necessary to programme success and then relationships to each other. The personnel inputs in terms of quality

and quantity must be determined. The amount of change brought about by the experiments, especially increased food production, must be determined.**

48. I have quoted at such length from the Ford strategy in order the more sharply to bring home the contrast between it and that which the GOI implemented in Ford's name and with a Ford grant. In 1961, the so-called "Intensive Agricultural District Programme" (IADP) was inaugurated in India. By 1963, in contrast to the Ford team's recommendation of "about five contigious villages per group", the IADP was operating in fifteen districts, each district containing an average of 1855 villages.*** And this, was described by (then) Union Minister for Food and Agriculture, C. Subramanian, as "concentration of available resources and efforts in selected areas."*

49. The basic concept of the IADP is the "package of improved practices" which is designed for each crop and tailored to the particular soil conditions of each district. It is this which has given the Programme its popular name of "Package Programme". There were two principal criteria employed for selecting districts: "Maximum irrigation facilities" and "Minimum of natural hazards".** The district centers, mainly administrative units, may (in some cases) have been selected for their existing marketing importance;*** but there is no indication in the Indian literature that these centers are being employed now as sites for location of

**FOOD CRISIS, Ibid., pp. 248-250.

***Ministry of Food and Agriculture, IADP: Second Report (1960-63), New Delhi: 1966, p. 6.

*Subramanian, "Foreward" in M.S. Randhawa, Intensive Agricultural Programme, Indian Ministry of Food and Agriculture, New Delhi: August 1965, p.

**IADP, op.cit., p.i.

***Personal communication from Mr. Harold Miles, formerly of the Ford team,

agricultural services. According to this literature, "The IADP districts may be viewed as the first tier in a three-tier system....The second tier comprises the other districts in the country having a potential for rapid development, but limited by the availability of the requisite inputs and personnel. These are called the IAA (Intensive Agricultural Area) Districts. The third tier includes all other districts in the country. In this three-tier concept, the vanguard comprises the IADP districts [sic] which are supposed to serve as 'path-finders' and 'pace-setters'".* One important function (possibly thesole function) which some of these lesser-order "tiers" play is to serve as control areas against which to compare the performance of the IADP districts.

50. The IADP Second Report gives a considerable amount of cost data, but says very little about benefits, realized and projected. But some light is shed on this question in the following remark: "A significant conclusion of the report is that the full impact of the IADP is likely to take a much longer time than the five years contemplated in the original formulation of the programme."** The few quantitative estimates purporting to reflect "benefits" in fact only indicate expansion of instrument employment, e.g. total consumption of nitrogenous fertilizer grew perhaps 2½ to 3 times faster in IADP than in non-IADP districts.***

51. It is difficult to reconcile the GOI's desire for a "concentrated approach to agricultural development"* with obviously

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*IADP, op.cit., p. ii.

**Ibid, p. vi.

***Ibid. p. iv.

*Ibid., p. 3.

self-congratulatory statement such as these: "In the selected districts, an attempt is being made to saturate the entire cultivated area...."** or: "In Ludhiana, all 1004 villages are now fully covered by service cooperatives which supply credit and production requisites....It is estimated that 96per cent of the cultivating families are now covered by the cooperatives"***, or: in Ludhiana, "some 400 godowns would be required to saturate the district".* It is simply impossible to tell from the GOI publications just what is meant by "saturation". Does the Ludhiana godown target of 400 imply a strategy of 1 godown to service every 2½ villages, or are the godowns to be clustered in various marketing centers? We just don't know. This pattern marks the entire Second Report (In Raipur, with 3855 villages, "Cooperative credit societies cover all the villages".** What does this mean?)

52. At least one of the Ford team's original hypotheses has been confirmed by the IADP. Total value of the agricultural produce marketed by the IADP cooperative societies increased from Rs.3.2 crores before 1961 to Rs.8.19 crores in 1963/64 and to Rs. 13.56 crores in 1964/65, showing an increase of about 325% in the size of operations. Ford had predicted that there was enormous previously unsatisfied farm demand for marketing services. "During the same period, the increase in the quantum of agricultural produce handled by cooperative marketing societies in the entire country [i.e. including areas outside IADP whose

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**Ibid., p. 4.

***Ibid., p. 270.

*Ibid., p. 271.

**Ibid., p. 213.

coops were not assisted) was to the extent of 30% only."***

53. It is too soon to fully evaluate the impact of the IADP. But the continuing food crisis, eight years after the Ford mission's presentation of "Steps to Meet It", suggests that something is amiss. It is not impossible that the "something" is the persistent Indian preference for a "saturation" agricultural/rural development strategy. The cycle may have turned once again; the GOI has, during the summer of 1967, decided to embark on two "market town" experiments in Bihar and Uttar Pradesh,* experiments which presumably will be based on Professor Johnson's recommendations. It will be interesting to see how (and if) the Indians implement this program.

***
Ibid, p. 65.

*
private communication from John P. Lewis, Chief of the AID/India Mission, to Professor E.A.J. Johnson, and transmitted to me, August, 1967.

IV. Latin American Proposals for RGC-Type Experiments

54. At least one former member of the Ford "Food Crisis" team has continued to promote the rural growth center or "village cluster" development strategy in Latin America. Rene Eyheralde, at a recent international conference on rural planning held in Venezuela, presented a model for designing and locating clusters of "agricultural hamlets", villages of perhaps 100 families, groups of which would be serviced by some strategically located and/or endowed village or town which would become the marketing and service center for the group. Eyheralde calls each group of villages, together with its central service town, a "basic settlement."*

55. The Government of Venezuela is currently designing plans for implementing a central place-oriented rural organizational strategy. Initially, investments are to be addressed to the "rural community", defined as "a group of people bound to a cultivable tract of land, whose houses are situated within the same area and who receive their basic services from the same community center." The "second phase" will entail the "amalgamation of various of these communities around a center of more complex services." At the final stage, many such "integrated communities" would be bound together by "regional rural centers", linked by

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* Rene Eyheralde, "Grouping of Rural Dispersed Population in Agricultural Villages", working paper #4 in U.N. Bureau of Technical Assistance Operations and the Centre for Housing, Building and Planning, in Cooperation with the Venezuelan Ministry of Public Health and Social Assistance, and the World Health Organization, Interregional Seminar on Rural Housing and Community Facilities: Working Papers, Maracay, Venezuela: April 2 -.19, 1967.

roads and rail lines.**

56. On November 30, 1964, the Government of Brazil created a National Institute of Rural Development (INDA). The most important activity of INDA thus far has been its formation of the so-called "Model-Municipalities" Program, the idea of which is to focus rural investments in one potential "growth pole" per State as a means of ultimately achieving "the integration of rural Brazilians into the economic development and social well-being of the country."***

57. The first national meeting of the mayors of the 20 selected model municipalities was held during the week of April 11,1966. This meeting produced a "Basic Document" (available through AID/LA), which outlines the goals of the program, criteria for site selection, etc.

58. The basic purpose of the program is summarized by the Document:

> It was considered as indispensable and unpostponable the concentration of human and material resources destined to promote the evolution of the situation of the rural people through a whole series of socio-economic provisions in the Model-Municipalities.*

59. I have not, as of 18 August, 1967, been able to ascertain whether or not this program has been implemented.

** Raul Alegrett, "Rural Housing and Village Planning", working paper #1 in Interregional Seminar, Ibid., pp. 3-4.

*** Louis Miniellier, Community Development and Other Social Action Programs, Brazil - 1966, AID/LA/DP, p. 6.

* Miniellier, Appendix B, p. 3.

V. Regional Planning in Poland

61. The Polish government has employed a town-centering strategy for rural development for many years, recognizing that "provision must be made for the efficient supplying of a set of basic services . . . facilities which satisfy entirely all everyday needs of both the population and the personnel of the farm." * The most efficient way of distributing these services is through a network of regional centers, which "consist either of settlement units which, as a result of a spontaneous development process, have just approached . . . the right pattern and will require only some adjustments, or selected settlement units which must be just now developed and shaped in a reasonable way." ** These economic centers are to be distinguished from the "district centers", which are administrative units and are located accordingly.

62. One of the principal criteria by which those economic centers are selected is relative production intensity within their "area of influence" or, as the Poles call it, their "radius of serviceability". Stasiak says that "In many socialist countries, the value of the radius of serviceability (for instance, in stock and grain production) is determined by the isochrone up to thirty minutes." ***

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*Andrzej Stasiak, et. al., "Some Problems of Housing and Rural Planning in the Socialist Countries of Eastern Europe", working paper #5, Interregional Seminar, op. cit., p. 31.

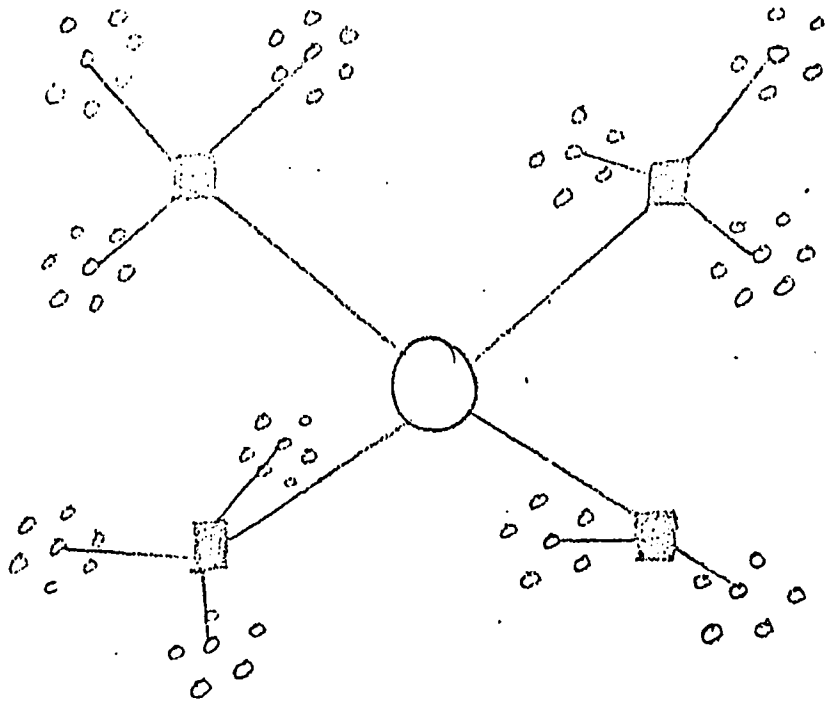
**Stasiak, Ibid., pp. 31-2.

***Ibid., p. 24.

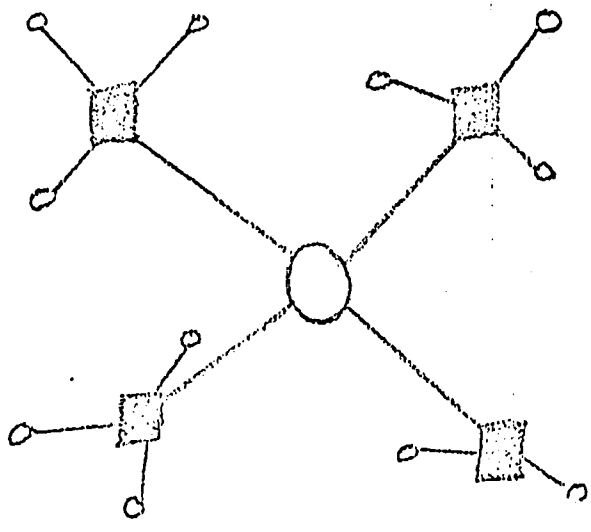
63. The services and activities located in these regional economic centres include farm products purchasing offices, bakery and butchery shops, restaurants, dairy-works, the agricultural cooperatives (with their storage and fertiliser-distribution facilities), artisans' shops, mechanized workshops, sport centers, kindergartens, nurseries, laundries, public baths, health clinics, etc. The function of these services is to make "the living conditions in the country side more and more similar to those in towns." Furthermore, "The process of mechanization [of agriculture] has caused the need to develop a technical service which is concentrated, in the first line, especially for these purposes, in a network of State machinery centers, [located] in the economic and social centers". Similar networks have been developed for rural nurseries, village cinemas, public libraries, and radio and television. "It is worth mentioning that broadcast and t.v. networks provide many programs on modern agricultural methods." *

64. A schematic diagram of the existing network of Polish central places is provided on the next page, together with a diagram of the revised program presently under consideration by the government. The purpose of the change would be to relocate as many farmers as possible from the village clusters into the cluster center, thus achieving (expected) economies of scale in housing, utilities, and marketing.

*Ibid., pp. 45-56.



Current District Scheme of Rural Settlement in Poland



key:

District Centre (admin.)

Service Activity Centre

Village Cluster with Central Village

Proposed Centralization of Rural Settlements in Poland

source: Stasiak, Ibid.

VI. RGC's and the Importance of Transport-Access: the Case of Nigeria

65. For several years, the International Labour Office has been engaged in a project in Nigeria which has as its goal the creation of sufficient rural employment to slow down the rate of migration of rural Nigerians to the capital city of Lagos. The ILO Pilot Project area (see maps below) includes about 130,000 persons, over 100,000 of whom have traditionally lived in scattered villages ranging in size from 100 to 5,000 persons. The predominant tribe in the area is Yoruba. During the course of the project, observers noticed a most interesting phenomenon developing; as the road system was built up (part of the project), a spontaneously developing network of market towns emerged, whose net impact has been to increase substantially the marketed agricultural surplus in the area. This story, of which the Brookings Transport Program apparently was not aware, is described below. *

66. The development of the road system in the ILO area has been underway for about twelve years. At first,

> . . . many villages within reach of a road . . . set up small shelters at the roadside, to which their villagers [could] bring their produce.
>
> The advantages of this roadside position are many. It not only brings the villagers into closer touch with larger and more distant markets, but also enables them to sell produce, food and refreshment directly to traders and other road-travelers. Moreover, the roadside offers

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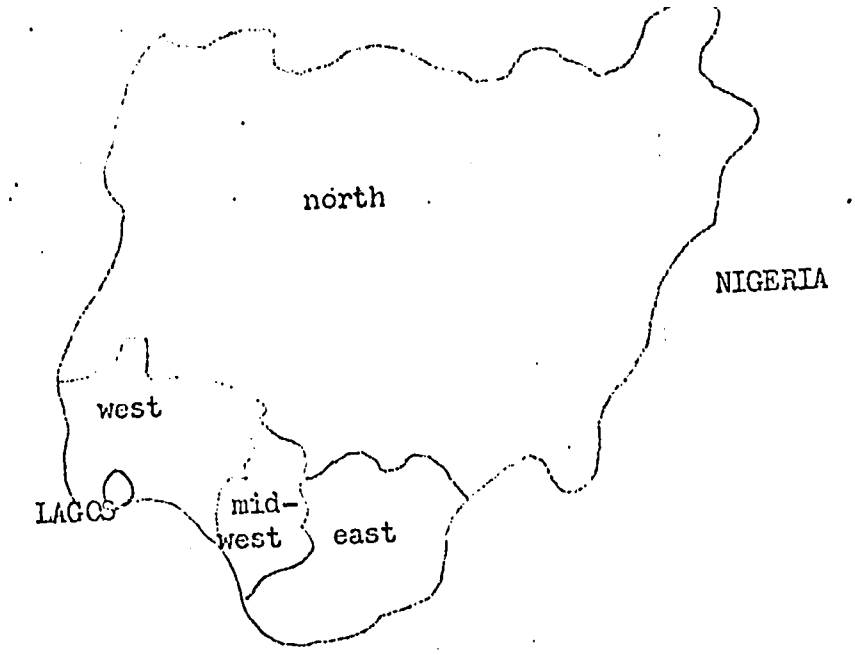
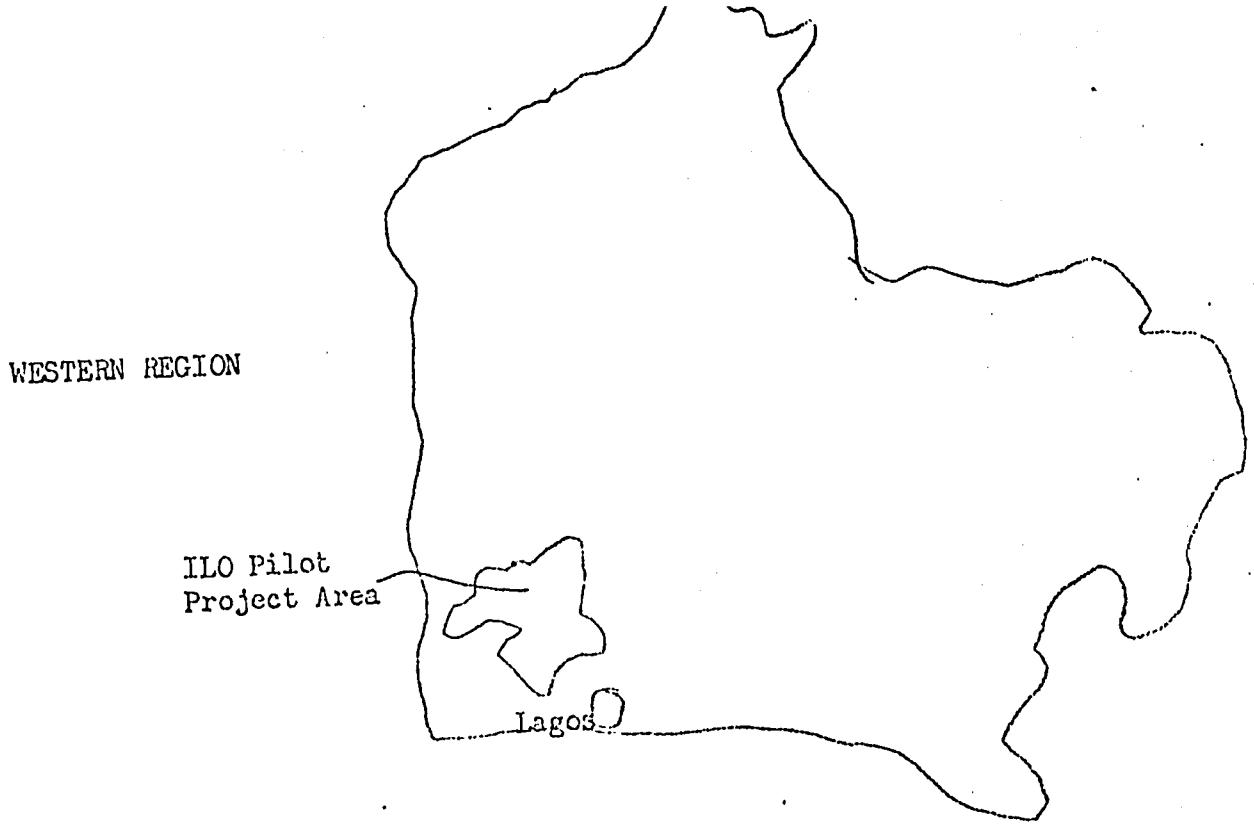
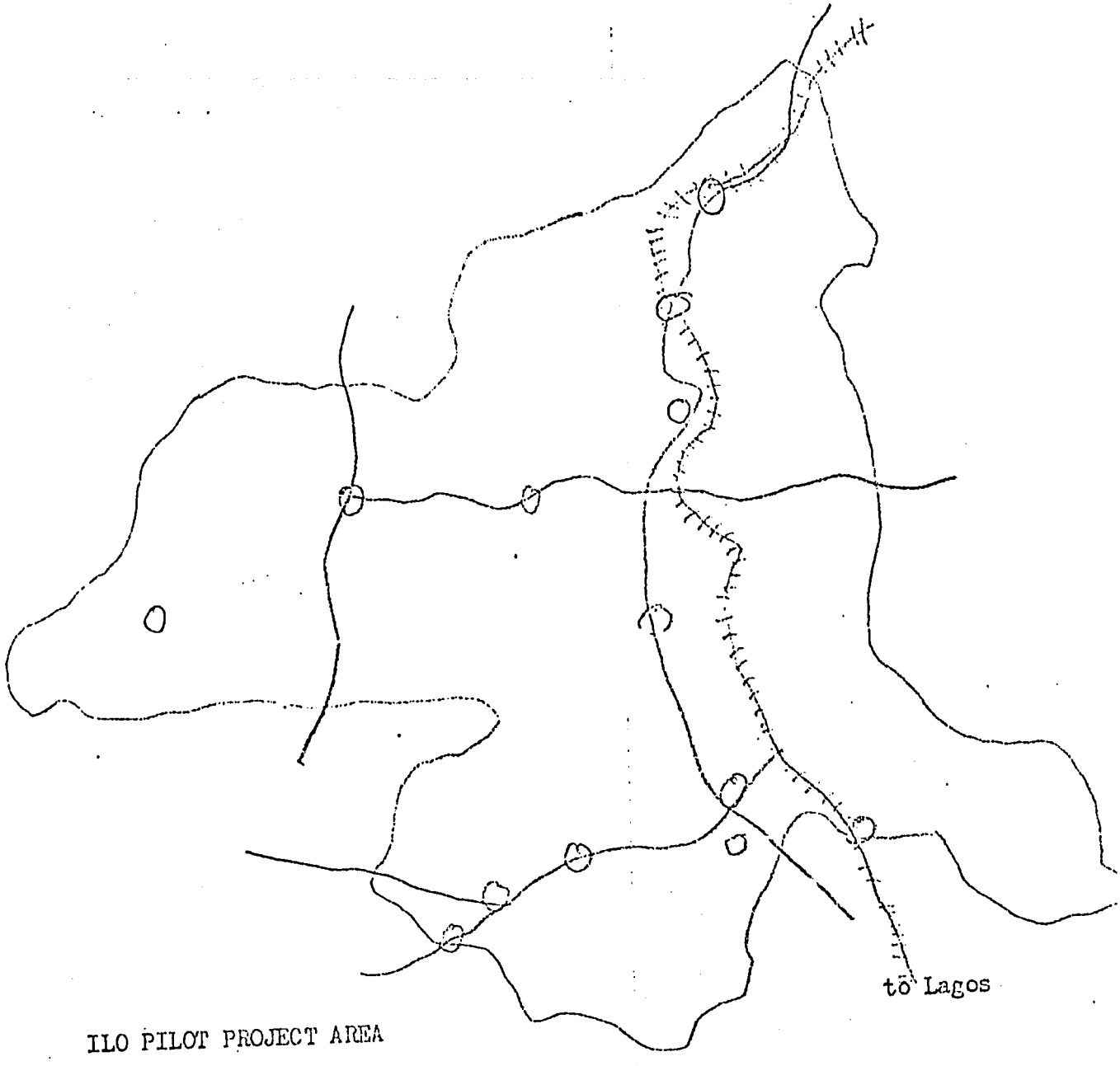
*Patrick Crooke, "Changing Settlement and Housing Conditions and Changing Building Practice in a Rural Area: An Example in Nigeria", working paper #10, Interregional Seminar, op. cit.


north
NIGERIA
west
LAGOS
mid-
west
east


WESTERN REGION
ILO Pilot
Project Area
Lagos



ILO PILOT PROJECT AREA

O = main marketing centers

----- = all-weather roads

+++++ = railroad

> other benefits of a less tangible kind: the advantages of a progressive contact with the outside world and the opportunity of displaying oneself and one's property to a wider audience than kin and neighbors alone can provide. **

67. Gradually, the roadside market became the location for the owning villages's new houses. Thus "in the course of time--house by house--the roadside village [evolved], while the original roadside shelter for villagers and their produce [became] outgrown and [were] replaced by a more complex arangement of trading stalls." ***

68. Apparently the road-system has become a focal "line" for <u>evolutionary</u> (and quite rapid) development of market centers. In fact, Patrick Cooke, an observer of these developments, writes: "During our studies in the area, we have found that the villages and small towns showing most evidence of rapid growth are marketing centers on main roads [sic] ". * More specifically:

> Since the introduction of the roads, marketing in the area appears to be developing from an essentially 'cellular' system of similar market-circles . . . towards a linear and hierarchical system based upon roads and centers of differing importance, and linked directly to the major cities . . . **

**<u>Ibid</u>., pp. 7-8.

***<u>Ibid</u>., p.9.

*<u>Ibid</u>.

**<u>Ibid</u>., pp. 10-11.

CHAPTER FIVE

THE SELECTION OF EXPERIMENTAL SITES

1. The ultimate choice of experimental sites will depend upon the collection of a great deal of new data in the candidate market towns themselves. Because it is infeasible (in terms of the public budget and personnel resources) to send statistical workers into more than a small number of towns, we must devise some procedure for reducing the set of all existing market towns to a subset of manageable proportion. In this chapter, such a procedure is described, and (for demonstrative purposes) applied (insofar as possible) to the task of selecting possible experimental RGC sites in Mali, West Africa. This "model" is intended to serve as a point of departure, a reference; it is not intended as the last word on the subject. In fact, I have made suggestions throughout the discussion as to possible modes of extension and development. In order not to inconvenience the reader, the formal equations and decision rules are relegated to an appendix. Before commencing with the Malian demonstration, we may briefly describe the procedure, which is sequential.

2. Through a study of the country's comparative food crop advantages, a set of critical crops is specified. Each region of the country* is then assigne

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*For sake of convenience in research, we use whatever regional breakdown is actually employed by the LDC in collecting and collating its statistics.

a quantitative (cardinal, weighted) index reflecting its present and potential contribution to national production of these critical crops.** The indicator of present "regional economic importance" (A) is recent average annual percentage contribution by the region to national production of the critical crops. The indicators of potential "importance" are (B) regional land capacity for future expansion of critical crop production, and (C) regional rural population density. With respect to the latter, we assume that, ceteris paribus, the greater this density, the greater the potential for transmitting economic change through the agency of RGC's.*

**The long-run objective of creating extra-agricultural rural employment is not considered at this stage.

* It must be recognized that regions which "register" poorly in terms of indicators (A) and (B) may suffer from a bottleneck in, say, one critical factor (e.g., land-reclaiming irrigation or an all-weather road) which, if relaxed, might substantially improve their indices. This suggests that we are implicitly equating marginal with average "regional potential". I know of no other assumption which would permit a readily operational analysis, and so shall continue to employ it as a first approximation.

3. Indicator (B) is based on the concept of "potentially cultivable area" for critical crops, and requires for its calculation the consideration (by region) of soil fertility, rainfall, crop rotation possibilities, etc.

4. Given the overall regional performance indices, which are weighted averages of indicators (A, B, C), we arrange these in descending order. Starting with that region whose index is largest, we assign regions to a subset called the basic set of regions until some arbitrarily designated number of regions is included. This number might, for example, be determined by an estimate of the resources (money and statistical workers) potentially available for employment on the RGC experiments. For any particular country, there may also be relevant political constraints, e.g. region i must be included in the basis.

5. Having selected a basic set of regions, we proceed to the next stage of the procedure. By the same logic as obtained earlier, we wish to reduce the number of existing market towns in the basis to a "working set" of manageable proportion, into which statistical workers will then be sent in order to undertake the studies which will determine the ultimate choice of RGC experimental sites. Two criteria are proposed for this reduction process: (1) avoidance of possible "dormitory effects" and (2) "transport access".

6. By a "dormitory effect", we mean the possibility that, if a town lying within commuting distance of a major urban area is selected for investment, it may not develop an economic base of its own. The expansion of metropolitan areas through the creation of suburban "dormitories" is not an objective of the RGC strategy.

7. By "transport access", we mean the degree to which market towns have, by virtue of their location, access to regional, national and international markets via the transport network. "Degree of access" is given a quantitative dimension in my "model" in the form of a transport-access matrix which, in Dr. Nuhad Kanaan's terminology, indicates the relative "connectedness" of cities and towns in an area.

8. Through this device, it becomes possible to rank all existing market towns in the basic set of regions according to their relative transport access. From this ranking, we select the "best" town in each region in the basis. This set of towns we call the "working set of potential RGC's". Note that this criterion reflects our long-run planning objective. That is, we believe that transport access is a principal infrstructural prerequisite for long-run commercialization of the rural sector.

9. The final stage of the procedure consists of making detailed statistical studies in each of the market towns in the working set. In the present proposal, only guidelines for such studies are suggested (these were summarized in the project outline on p. 3.3 above; Section III.4). Other considerations will be incorporated according to the results of the RGC CASE STUDIES. From these studies and statistical surveys, the final choice of RGC experimental sites will be made.

A "LOCATION" MODEL FOR MALI

I. Selecting the Critical Crops

10. The crops which presently occupy the quantitatively most important place in the diets of the citizens of any LDC and/or in that country's export "bill" are not necessarily the crops best suited for those purposes. To be more explicit, a country may or may not actually have a comparative advantage in the crops which it presently produces in great quantities. A crop presently cultivated domestically may be more efficiently obtained via importation, and vice versa.

11. Thus we must select our list of "critical crops" carefully. There are several possible ways of going about this. The simplest is to adopt more or less wholesale the recommendations of some consulting agency, e.g., the IBRD or FAO, which has undertaken such comparative advantage studies for the country in question. The opposite extreme is to undertake the design of such a study as an integral part of the RGC research project itself.

12. A "sketch" of such a "comparative advantage" model is presented in the appendix. For the Malian example here, I have chosen to adopt the recommendations of a UNECA team. According to AID/Mali (whose judgment is based on recent actual production and trade statistics), the most important food crops in Mali include rice, maize, millet/sorghum, groundnuts, fish and cattle.* In 1965, a UNECA team recommended that Mali reallocate her resources,

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* U. S. A. I. D. Data Book - Africa, 1966.

wherever possible, so as to concentrate on production of improved millet/sorghum (MS), rice (R), and groundnuts (G)*. The latter offers the most promising export demand, rice is a more efficient staple than maize in the water-abundant central regions of Mali, and millet/sorghum provides not only a protein-rich cereal for human consumption but also a cheap component for livestock feed.

13. Therefore, we shall consider (G, R, MS) as our set of "critical crops".

II. Selecting the Basic Set of Regions

14. In order to employ our three indicators of regional potential, we shall need to be able to make the following kind of quantitative statement: in terms of their potential contribution to domestic diets and to foreign exchange earnings, G is x times as "important" as R and y times as "important" as MS. In the appendix, a procedure (which employs linear programming and other techniques) is suggested for quantifying such a relationship. First, the three crops are related according to their "export-importance", i.e., to their potential as earners of foreign exchange, as reflected in their relative f. o. b. export prices. The crops are then compared according to their relative "consumption-importance", as measured by their respective caloric and protein content. Finally, these two indicators are aggregated by employing

*UNECA, Report of a Mission for the Study of Problems and Prospects in Rural Development of Mali, Niger, and Upper Volta, Addis Ababa: February, 1966, document E/CN.14/SWCD/29, pp. 135ff.

as weights, their respective marginal rates of substitution (MRS). For example, $MRS_G = 0.11$, signifying that G is much more "important" as an export than as a consumption good. The results of these calculations (shown in detail in the appendix) are as follows:

<u>As Consumption-good versus Export-good</u>:

G: C-importance < EX-importance

R: C-importance > Ex-importance

MS: C-importance > EX-importance

<u>Export-importance</u>:

G > R < MS

<u>Consumption-importance</u>:

G < R < MS

<u>Overall weighted importance</u>:

G < R < MS

(G = 9.2R = 8.0 MS)

15. We are now ready to employ our three indicators of regional potential. Indicator (A) measures recent or current percentage contribution to national production of the critical crops originating in each region. For every region in the country, we calculate these percentages for G, R, and MS. Using the crop "trade-offs" calculated earlier (i.e., G=9.2R=8.0 MS) as weights, we can add these percentages and derive a single indicator (A) for each region. The results for Mali, in ordinal terms are as follows*:

Bamako > Kayes > Sikasso > Segou > Mopti

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* We are excluding the Gao Region from the analysis since it produces only 2% of national food output.

16. Indicator (B) measures land potential for expansion of critical crop production. For each crop within each region, this "potential capacity" is estimated as the ratio of current to potential number of annual crop rotations times the ratio of current to potentially cultivable land. The second and fourth variables are based upon soil studies, assessments of water availability, etc. Such estimates are contained in most FAO and IBRD country study reports. Again, using the crop trade-offs as weights, we are able to derive overall (B) indicators for each region. We wish to assume that, the greater the unutilized capacity, the greater the potential. Therefore we want to work with the reciprocals of these (B) indicators. The (ordinal) results of the Mali calculations are:

Sikasso $\succ$ Bamako $\succ$ Kays = Mopti $\succ$ Segou

17. Indicator (C) simply records the rural population density of each region. For Mali:

Segou $\succ$ Sikasso $\succ$ Mopti $\succ$
$\succ$ Bamako $\succ$ Kayes

18. By this time, we have calculated three index numbers for each of Mali's five regions. We now have need of some method for weighting the three criteria in order to be able to construct single indices for each region. These weights must not only reflect the relative importance of indicators (A, B, C). They must also somehow ensure dimensional commensurability among units. In my "model", indicators (A) and (B) are expressed as pure numbers, but indicator (C) is given in numbers of people per 100 km^2. I must confess that I don't know as yet how such a set of weights is to be derived. This task will have to be undertaken if the present location model is to be fully operational. For the moment, let us assume that the

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weights (whatever they are) are such as to suggest the following overall regional ranking (note that, given the weights, the actual ranking will be cardinal, not ordinal as here):

Bamako > Sikasso > Kayes > Segou > Mopti

As may be seen in the Appendix, this ranking is not inconsistent with the underlying (A, B, C) relationships.

19. We have now to select some subset of this (ranked) list of regions. Assuming there are no operative political constraints (recall that in the actual Djoliba pilot project, the GOM insisted that the village be located in Bamako region), let us arbitrarily select the best three regions. Then Bamako, Sikasso, Kayes is our basic set of regions.

III. Selecting the Working Set of Potential RGC's

20. The "working set" of RGC's will consist of the "best" existing market town in each of the regions in our basis. Therefore, the object of the following exercise is to select, from among twenty existing market towns in the basic region (consisting of Bamako, Kayes and Sikasso), a feasible or "working" set of three towns. Later, we shall indicate how,

using the statistical surveys, the towns in this "working set" may be ranked and thus given priorities for experimentation. The actual or "basic" set of RGC experiments will, then, include not more than but possibly less than the number of towns in the "working" set.

21. Probably the most convenient (and certainly the most interesting) method of reduction is to employ a series of overlaying maps. These maps will collectively indicate the relative degree of transport-access of each existing market town in the basic region. We are here implementing the principal conclusion of many recent studies (e.g. the Brookings Transportation Program, E. A. J. Johnson's and Louis Herman's papers on Indian marketing, et. al.) that access to transportation linkages with outside areas is probably the single most important factor in generating rural development.

22. Map 1 indicates the outer boundary of the basic region and locates all urban places (using whatever criterion of "urbanity" was employed earlier in estimating rural population densities). These may be designated by the letter "U". Around each "U", draw a circle radius r. This radius is the locus of points beyond which no significant number of people employed in that "U" is likely to wish to commute daily. On p. 5.4 above, we explained why the possible "dormitory effect" of choosing an RGC within this radius would be undesirable. Naturally, this r will be non-homogeneous for different countries and even for different places within a single country. Again to expedite the analysis, given the scarcity of resources, we may choose the largest r for any particular country, and employ that value for all central places in the country. The estimation of this maximum r might be based

upon extensive sampling of commuting habits. It is likely, however, that the educated guesses of planning/political personnel in the LDC will serve as reasonably good approximations. The value assigned to r by the AID team which designed Djoliba in Mali was 45 km, and that is the figure we too shall employ.

23. On Map 2, locate all existing market towns. At this stage, we don't need to know their relative importance or size. General familiarity with the marketing system of the LDC--and intelligent interviewing of its planning personnel, particularly those associated with agricultural extension and regional administration--will suggest what and what not to include. Any formal criteria (e.g. as to minimum size in terms of population) are almost certain to be misleading*. In any case, whatever the selection process employed in any particular case, Malcom Rivkin's advice to "think small" ought to be kept in mind. Around each Map 2 market town (which might be identified simply by a point), draw a circle of radius f. This represents the "field" of the town, whose radius is the maximum distance a farmer can travel in one day in order to come to town, engage in marketing activity, and return to his village or farm. f will obviously depend upon the prevailing mode of personal transportation locally employed, e.g. bullock. Again this radial measure is likely to vary greatly among areas. For most purposes, I do not think it a particularly useful concept. In the present case, however, the choice and employment of some f for all market towns in the basic region is not, I think, quite so questionable. It will be used

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* See footnote on p. 1.3 above.

here primarily to preclude the possibility of ultimately including geographically contiguous towns in the working set. To do so would surely constitute a waste of resources and would violate the experimental intention of the proposal. The AID team in Mali chose a value for f of 10 km, the principal personal transport mode being walking.

24. On Map 3, locate all transport routes, regardless of mode. Only rivers (or portions thereof) which are navigable are to be included in this mapping. In the Appendix, a series of codes is suggested, which reflect the degree to which transport routes penetrate areas external to the basic region. These codes are written along the margins of Map 3.

25. By superimposing Map 3 on Map 2 on Map 1, we can readily identify the "transport-access" of each market town in the basis, and can also identify (and eliminate from further consideration) towns which lie within the circle (of radius r) of urban centers. This information is now translated to the transport-access matrix, as shown in the Appendix. From the matrix, we can calculate transport indices for each town. Ranking towns in order of these indices, and starting with that town whose index is greatest, we move down the list and select the "best" town in each region in the basis, i.e., until we have selected three towns*. This is our working set of potential RGC's. According to my calculations, the three "best" towns in Mali, ranked in order of transport-access, are Kayes, Djoliba, and Bougouni.

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* This procedure is subject to certain rules whose function is to preclude the possibility of including geographically contiguous towns in the working set; see Appendix.

27. In the preceding process of reducing the universe of 20 market towns to a working set of 3 potential RGC's, the principle analytic device was my transport-access matrix. While the basic concepts embodied in this device are, I think, meaningful, the matrix in its present form is too simplistic. By not explicitly attaching weights of some kind to the cell entries, I have implicitly assigned them equal weights. That is, no operational distinctions are made between different modes of transportation, and no significance is attached to distances between towns or to the value of freight passing over the various routes. One result of this is that there are many "ties" among towns. I wish now to suggest at least one possible modification of the device. Instead of recording the existence of transport linkages by dichotomous variables, as I have done (see appendix), it ought to be possible to record the actual mileage between towns, weighted according to the mix of transport modes utilized. These weights might conceivably be derivable from the results of the Brookings Transport Program studies.* For example, if towns M_1 and M_2 are connected by a 200-mile route consisting of 100 miles of road and 100 miles of railroad, then, assuming that road transport is, say, twice as "important" as rail transport, the "economic distance" between M_1 and M_2 equals 300 miles. The choice procedure would then consist of ranking towns in ascending order of "economic distance".

* In fact, a system similar to my transport-access matrix has been developed by Nuhad Kanaan in The Structure of the Transport Network of Syria, one of the unpublished Brookings monographs. Kanaan suggests possible methods of comparing the "development impact" of various modes, although he is mainly concerned with roads. Another possible source is Henri G. Irani, Contribution a l'Etude des Transports au Mali, République du Mali, c. 1965.

Towns linked to the largest number of other economic centers by the "best" transport modes having the smallest "economic distances" would rank higher than towns not so situated. An even more sophisticated extension might entail further weighting of these "transport indices" by volume or value of freight hauled per unit time.

28. Whatever extension of the basic system is undertaken, the central idea ought to be retained. We must think of the transport network as a system of inter-center linkages. Towns located advantageously with respect to this system have a greater potential both for receiving and for "exporting" goods, services and ideas, than towns not so favorably situated.

IV. Selecting the Basic Set of RGC's

29. The final stage of the selection process requires sending statistical workers into the three towns in the working set to collect data which will enable the planners to state relative preferences among these towns. Even were it possible to invest simultaneously in all twenty towns, the present analysis would be necessary. Up until now, our perspective has been highly aggregative; it is possible that Kayes, for example, markets no G, R or MS at all! Given our objectives, we surely would not wish to begin the experiment with Kayes.

30. Since the requisite data has still to be collected, it is obviously not possible for me to go any further in this Malian example. The criteria for RGC potential which should guide the collection of data in the towns are listed in section III.4 of the outline on p. 3.3 above. In the instant chapter, I wish only to make this procedural suggestion:

31. In projecting the impact of a developing "growth pole", we need some estimate of the field of influence of that pole. The concept of an

RGC's "field" was employed earlier, when we constructed circles of radius f around each market town on Map 2. Now we want to drop the homogeneity assumption made at that time, and determine rather more carefully what are the boundaries of the effective fields of our "working" towns. I suggest that the sampling procedure for identifying these fields be based upon that designed by Neale, Singh and Pal Singh for their study of Kerali market in the Indian Punjab in 1960-61, relevant portions of which are reproduced below. While the data on volume of crops marketed will be useful to us later, our present interest lies in the location of the outermost villages or farms of origin (see underlined paragraph in the following reproduction)*

*Walter C. Neale, Harpal Singh and Jai Pal Singh, "Kurali Market: A Report on the Economic Geography of Marketing in Northern Punjab", Economic Development and Cultural Change, Jan. 1965.

Sampling and Measurement Procedures

The maps are based upon a sample of arrivals during the busier seasons. The receipts which commission agents turn into the marketing committee each day for each sale show the commodity, amount, price, and village from which the farmer came. Since organizing this data for an extended period was beyond our resources of time, we settled on a sampling procedure, taking all the arrivals for each Monday from mid-April to the end of May (6 Mondays) to represent wheat marketing; for each Monday from the end of October to the end of November (5 Mondays) to represent groundnut marketing; and each Monday from mid-January to mid-March (8 Mondays) to represent the sugar (gur) marketing season.[19] From these receipts the total weight and number of all arrivals from each village was computed, as were totals for the major crops (wheat, groundnuts, and gur). Since villages vary in size (both area and population), we felt it desirable to deflate the totals, and because the acreage data was more convenient and the available census data of population was a decade old, we decided to deflate by the acreage of each village and express our intensities per one hundred acres. This, of course, makes no allowance for differential fertility, arable area, or irrigation, which means, on the one hand, that the topographic characteristics of the region will show up in the mapping, a good result, but also that villages with small populations compared to area and with low yields will have low intensities, whereas from the point of view of these villages Kurali may be very important. It is not, however, at all clear how we could have made allowance for this last difficulty, since it would have involved weighting elements in the situation for which there are no standard measures, and weighting derived from our own data would have hidden all differences: this is because a system of weighting based upon our own data would have been tautological and if perfect would have brought us full circle to perfect concentricity. Perfection would have required us to know the marketable surplus of each village and the amount of produce marketed in Kurali, or the proportion of surplus marketed by each village in the various markets. Only in that case could the relative importance of each market be discovered and the effect of productivity be eliminated. We therefore decided to keep the method as simple as possible, with the expectation that some interesting results would be hidden but that the pattern on the maps would reveal the most important determinants of geographical distortion.

In computing indices of frequency and intensity of total arrivals from each village we simply add the weights of each crop. Since the ratios of bulk-to-price

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19. In presenting our results to two seminars at Punjab University the choice of Mondays was criticized on the grounds that a bias might enter because it followed immediately upon the weekend. However, there seemed to be no agreement on how this bias might affect arrivals and especially why it should distort the composition and villages of origin, nor why any other particular day should introduce less bias—and some sampling procedures suitable for a foundation project were suggested. As will become apparent, we are not convinced that any minor improvements would have helped. As for Mondays, it should be remembered that Sunday is an official (because English-based, bureaucratic) holiday, but since it is not a traditional Sikh or Hindu holiday it should not be thought to affect Indian as it might Christian farmers.

and weight-to-price affect the value and size of each arrival, one could argue that we should have devised a weighting scheme. However, the large number of less-than-full cartload arrivals indicated that weight and bulk did not appreciably limit the size and value of arrivals, and the difference in prices was not so large as to introduce a misleading bias. Only exceptionally did the prices of the major commodities (wheat, maize, gur, groundnut) differ by as much as fifty percent, and all usually lay within the range Rs. 16 to Rs. 22.[20]

The Shape of the Market-Shed

To the northeast of Kurali (see Map 2) the land is poor, rising toward the Siwalik Hills and deeply cut by eroded stream beds running southeast to northwest. The land west and northwest of Kurali is the most fertile, and irrigation is available only west of the Kharar-Kurali-Rupar road. Cutting across the road in a westerly direction between Kurali and Rupar is a main irrigation channel crossable only by a few bridges. The rest of the surrounding country is flat with few obstructions.

Map 3 (Intensity of Arrivals) shows that most of the produce comes from west of Kurali. The proposition that more will arrive from the areas closer to Kurali—the hypotheses of decreasing intensity with distance—is partially upheld by the small degree of intensity east and north of Kurali and on the southern fringes, especially toward Kharar. However, the correspondence between hypothesis and observation is small, since intensity is light indeed immediately around the town. Taking the two highest ranges of intensity, the blocks extend unbroken to the westward limits of the market, although narrowing to a neck. Here the highest intensity is directly associated with the more highly productive land. The pattern shows clearly for gur, less clearly but still markedly for wheat, but is only barely visible for groundnut (Maps 4, 5, and 6).

The minor variations between the maps of the three main commodities show a slight tendency for the center of gravity of groundnuts to lie north of that of wheat, and pockets of high intensity for wheat and groundnuts to lie to the east compared with a large pocket of low-to-medium intensity for gur.

In mapping the market patterns, we have used the boundaries of the villages that form a continuous block around Kurali as the outer limits of the market-shed, because there were few villages mentioned in the receipts which did not fall within this area, and extension of the area to account for those few villages would only have extended the region of lowest intensity.

The reader may wonder to what extent the visual effect of the mapping depends upon the arbitrary division of intensities for the purpose of mapping. The answer is that the data has not been doctored: we would like to believe that our strong devotion to scholarship kept us honest, but the fact is that tentative maps with more divisions and with different divisions did not alter the general pattern. Of course, there were changes, for one could make the maps look blacker or lighter, but small changes in the ranges move the boundary lines very little. More importantly, new

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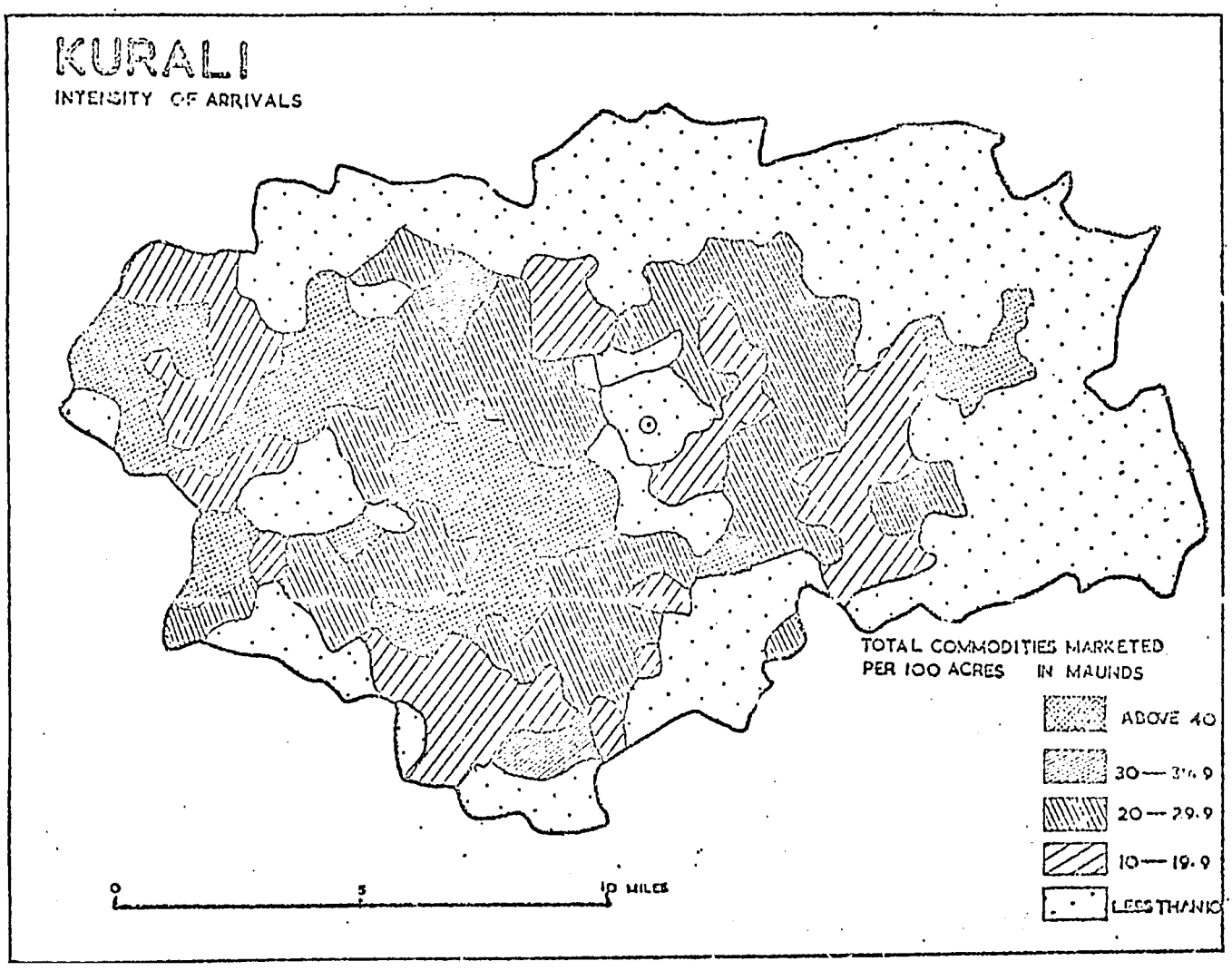
20. There was also the problem of what prices to use in any weighting scheme, for there was no clear regularity in the relationship between the prices of the major commodities. See Charts 5, 6, and 7.


KURALI
INTENSITY OF ARRIVALS
TOTAL COMMODITIES MARKETED
PER 100 ACRES IN MAUNDS
ABOVE 40
30—39.9
20—29.9
10—19.9
LESS THAN 10
0
5
10 MILES

low-medium areas do not appear in the low-intensity, speckled sectors, nor do speckled sectors appear in the high and high-to-medium sectors. On balance, we thought that four divisions of intensity presented the results without straining the eye with detail. In the case of groundnuts the lowest intensity was divided to indicate that what change there was as a result of decisions about divisions of intensity followed the general pattern of higher intensities in a band extending from south to northwest of Kurali, tending to bulge toward the northwest.

Our major doubts about the accuracy of the marketing patterns revealed by our sampling did not arise from the arbitrary elements of picking upon Mondays or of constructing intensities by dividing by village acreages. We did, however, wonder whether a somewhat larger sample, perhaps using Wednesdays or Thursdays as well as Mondays, might not have altered the results in one of two opposite directions. First, the islands of heavy intensities lying among low intensities to the east and the pockets of light intensities lying within the band of high intensities to the west might have been a quirk or sampling error, it just happening that villages in these areas delivered more or less than usual on our sampling days. Secondly, and conversely, the pockets might have been reinforced—either somewhat enlarged or made even more intense—by a larger sample. While the former would have been aesthetically satisfying and the latter intellectually piquant, the number of arrivals investigated was so large that we have no doubt that the pattern of heavy eccentricity of intensity to the west and northwest is an accurate reflection of the pattern of marketing. And, as mentioned above, the high intensity areas, even when very small, do not represent the chance occurance of one village but consist of an area of several contiguous villages, indicating that there is significance rather than happenstance attached. Had time been greater—appreciably greater—we would nevertheless have been happier with a larger sample, even if only of four to six additional sampling days.

APPENDIX:

THE FORMAL RGC SITE SELECTION MODEL AND MALIAN APPLICATION

1. Selecting the "Critical Crops"

Given the objective of determining in which crops an LDC has a comparative advantage in terms of its physical resources, the selection procedure may conceptually be represented by a Chenery-type linear programming problem. I do not suggest that the following be actually employed. It is only a "stylized" model of the kind of procedure which would be involved in determining comparative advantage.

The objective of this program is to maximize Gross National Product originating in food crop production. Let $\{C_i\}$, $i=1,2,\ldots,n$ be the set of all food crops domestically produced (or "produceable") and/or imported. The constraints consist of current (or projected) availability of land (by soil type), water, and Foreign exchange. This list is, of course, indicative rather than exhaustive.

$$\text{MAX: } \sum_{i=1}^{n} \left(p_i^{dom} C_i^X + p_i^{fob}\, C_i^{exp} - p_i^{cif}\, C_i^{imp}\right)$$

SUBJECT TO:

	C_1^X	C_1^E	C_1^M	C_2^X	C_2^E	C_2^M	.....	C_n^X	C_n^E	C_n^M	Constraint
Land:											
Soil 1	a_{11}			a_{12}			.....	a_{1n}			$\bar{L}_1$
Soil 2	a_{21}			a_{22}			.....	a_{2n}			$\bar{L}_2$
⋮		⋮			⋮		⋮		⋮		⋮
Soil k	a_{k1}			a_{k2}			.....	a_{kn}			$\bar{L}_k$
Water	$a_{k+1,1}$			$a_{k+1,2}$			.....	$a_{k+1,n}$			$\bar{W}$
For. X-Ch.		p_1^{fob}	$-p_1^{cif}$		p_2^{fob}	$-p_2^{cif}$	.....		p_n^{fob}	$-p_n^{cif}$	$\overline{FX}$

where superscript (X) stands for domestic production for home consumption, and $\overline{FX}$ = net foreign exchange available for importing food crops. Formally, letting (NON-C) = all non-food output and K = capital flow, then

$$\overline{FX} = \sum p^{fob} (NON\text{-}C) - \sum p^{cif} (NON\text{-}C) + (K\text{-}IMP) - (K\text{-}EXP)$$

I am not sure whether the technical coefficient matrix $/\!A\!/$ ought to reflect the existing technology or whether it ought to be based upon, e.g., the many FAO/USDA-ERS "package practice" <u>recommendations</u> for various countries.

The solution to this program will consist of efficient "activity levels" for the (β_n) target variables. By adding together the C_i^X and C_i^E, we obtain efficient output targets for each of the n crops (some of which will, of course, equal zero). Arranged in descending order, this becomes <u>the new efficient</u> (cardinally) <u>ranked list of critical crops</u>. To make the rest of the analysis manageable, we might select (starting with the max-output crop) only the first <u>g</u> crops to play with. In my Malian example, I use three.

2. Selecting the Basic Set of Regions

The "Economic Importance Relation" for Crops

(1) $$a_1 C_1 = a_2 C_2 = \ldots = a_n C_n$$

where $\{C_i\}$, $i=1,2,\ldots,n$ = "critical" crops

$\{a_i\}$ = "economic importance" trade offs

Estimation of the $\{a_i\}$ proceeds as follows:

Marginal rates of substitution:

(2) $$MRS_i = \frac{p_c \, cal_i + p_p \, pro_i}{p_i^e}$$

where MRS_i = trade-off between the welfare impacts of an extra unit of crop i as consumption-good versus export good

cal_i = number of calories per unit of crop i

pro_i = number of protein/grams per unit of crop i

p_i^e = f.o.b. export price per unit of crop i. If crop i is not currently exported, then use the relevant price obtaining for some neighboring country.

p_c = shadow price of calorie

p_p = shadow price of protein/gram

Estimation of (2) requires solving the following linear program for (p_c, p_p):

MAX: $\Lambda = \lambda_c p_c + \lambda_p p_p$

SUBJECT TO:

$$cal_1 \, p_c + pro_1 \, p_p \leq p_1^d$$
$$cal_2 \, p_c + pro_2 \, p_p \leq p_2^d$$
$$\vdots$$
$$cal_n \, p_c + pro_n \, p_p \leq p_n^d$$

Where p_i^d = domestic price per unit of crop i

λ_c = FAO minimum daily per-capita caloric target appropriate to the particular country under study

λ_p = FAO minimum daily per-capita protein/gram target

Export-importance relation:

$$(3) \qquad C_1 = \left(\frac{p_1^e}{p_2^e}\right) C_2 = \ldots = \left(\frac{p_1^e}{p_n^e}\right) C_n$$

Consumption-importance relation:

$$(4) \qquad C_1 = \left(\frac{p_c\ cal_1 + p_p\ pro_1}{p_c\ cal_2 + p_p\ pro_2}\right) C_2 = \ldots = \left(\frac{p_c\ cal_1 + p_p\ pro_1}{p_c\ cal_n + p_p\ pro_n}\right) C_n$$

Estimating relation (1):

Let the ratios (p_1^c/p_i^e) from relation (3) be called α_k $(k = 2, 3, \ldots, n)$.

Let the

$$\left(\frac{p_c\ cal_1 + p_p\ pro_1}{p_c\ cal_i + p_p\ pro_i}\right)$$

from relation (4) be called β_k. Then relation (1) may be estimated as follows:

$$a_1 = 1 + MRS_1$$

$$a_2 = \alpha_2 + (MRS_2 \times \beta_2)$$

$$a_3 = \alpha_3 + (MRS_3 \times \beta_3)$$

$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$

$$a_n = \alpha_n + (MRS_n \times \beta_n)$$

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For convenience, we may divide through by (a_1), obtaining,

$$C_1 = (a_2/a_1)\, C_2 = \ldots = (a_n/a_1)\, C_n$$

which, for further employment, we rewrite as,

$$C_1 = b_2 C_2 = \ldots = b_n C_n \tag{5}$$

Indicator A: Regional Importance by Production of Critical Crops

There are $i = 1, 2, \ldots, n$ "critical crops," and $r = 1, 2, \ldots, k$ regions in the country. The k weighted indices of regional importance by indicator A are:

$$\overline{IA_r} = C^*_{r1} + \sum_{i=2}^{n} \frac{1}{b_i} C^*_{ri} \qquad \text{for all } r \tag{6}$$

where C^*_{ri} = percent of national output of crop i originating in region r

Indicator B: Regional Physical Capacity for Future Agricultural Growth

For each of the $r = 1, 2, \ldots, k$ regions, the weighted indices of regional importance by indicator B are:

$$\overline{IB_r} = \frac{1}{\left[\left(\frac{CNCR}{PNCR}\right)\left(\frac{CCL}{PCL}\right)\right]_{r1} + \sum_{i=2}^{n} \frac{1}{b_i} \left[\left(\frac{CNCR}{PNCR}\right)\left(\frac{CCL}{PCL}\right)\right]_{ri}} \tag{7}$$

where $CNCR_{ri}$ = current number of annual rotations of crop i in region r

$PNCR_{ri}$ = potential (maximum feasible) number of annual rotations of crop i in region r

CCL_{ri} = area in region r currently employed in cultivating crop i

PCL_{ri} = area in region r potentially available for cultivation of crop i, as determined by soil, water and other studies.

Indicator C: Regional Population Density

For each of the r = 1, 2, ...k regions, the value of rural population density is given by:

(8) $$\overline{IC_r} = \left(\frac{TP - UP}{TA - UA}\right)_r$$

where TP = total population in region r

UP = population of all urban places (suitably defined)

TA = total area in region r

UA = area of all urban places in region r

Ranking and Selection Procedure

As noted in the text (Chapter Five), some procedure must be developed for objectively specifying the relative importance of indices (A, B, C) as indicators of the present and potential capacities of the k regions for future expansion of "critical crop" production. For the present, let us assume that these inter-indicator "trade-offs" have been calculated; call them d_1 , d_2 and d_3 . Then

(9) $$\overline{I_r} = d_1 \overline{IA_r} + d_2 \overline{IB_r} + d_3 \overline{IC_r} \quad \text{for all } r = 1, 2, \ldots, k \text{ regions}$$

Arrange these in descending order of magnitude. Starting with that region whose $\overline{I}$ index is largest, allocate some arbitrarily designated number of regions to the basic set of regions.

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Selecting the Working Set of Potential RGC's

MAP 1: Location of Urban Places

Map 1 indicates the outer boundary of the basic set of regions and locates all urban places (using the same criterion of "urbanity" as was employed earlier in estimating population densities; see p. A.6 above). Designate these urban places on the map by the letter "U". Around each "U", draw a

circle of radius r, where r = the maximum distance beyond which no significant number of people employed in any of the country's urban places has demonstrated a propensity to commute daily, given the existing urban-suburban transport system.

Map 2: Location of Existing Market Towns

Map 2 also indicates the outer boundary of the regional basis. Here we wish to locate all existing market towns, suitably defined and represented on the map by points. Around each point, draw a circle of radius f, where f = the maximum distance a farmer can travel in one day in order to come to town, engage in marketing activity, and return to his village or farm. f depends upon the local prevailing mode of personal transportation and upon the state of (e.g., the existance of) access routes to each market town. It may not, therefore, have a unique value for the entire basis. Experience indicates, however, that the number of values which f is likely to take in any basic set of regions is relatively small.

Map 3: The Transport System

On Map 3 (whose boundary, once again, identifies the regional basis), locate all transportation routes. Modal symbols commonly employed by cartographers are:

hard-surfaced road:

dirt-surfaced road:

railroad:

internal waterway:
(canal, river) :

Only waterways which are navigable (or portions thereof) are to be included in this mapping.

Using regional, national and international maps (as well as any other sources, e.g., private studies), determine the following information about each route:

1. the number of towns (i.e., non-urban central places) outside the basis but inside the country which have direct access to the route. Letting the number of such towns = s, then record this observation as $T_{oB} = s$ ($s \geq o$).

2. the number of cities (i.e., urban places) and/or ports outside the basis but inside the country which have direct access to the route. Record this as $(c/p)_{oB} = s$.

3 the number of towns outside the country which have direct access to the route. Record this as $T_{oc} = s$.

4. the number of cities and/or ports outside the country which have direct access to the route. Record this as $(c/p)_{oc} = s$.

The Transport-Access Matrix

The matrix and the definition of symbols not already explained above, is shown on the next page. All cell entries may be estimated by overlaying Map 3 on Map 2 on Map 1. A market town M is said to have transport-access if any transport route passes within the field (circle of radius f) of that town. In the matrix, eliminate (e.g., by encircling) all towns M which are seen from the maps to lie within the field (circle of radius r) of any urban place "U". "Deliveries" to such towns from other market towns in the basis are to be counted as usual, but no "deliveries" from such towns are to be counted. For example, if M_2 lies within the field of a major city, then all of M_2's row entries = 0, while its column entries are not modified.

Selection of the Working Set of Towns

Arrange the n market towns in the basis in descending order of their $\{Tl_i\}$. Starting with that town whose Tl index is largest, allocate to the "working set" the highest ranking town in each of the regions which make up the basic set of regions. If the field of some town on the list intersects that of any "higher transport-order" town already allocated to the working set, skip that town and proceed to the next town on the list. This rule will preclude the possibility of including geographically contiguous towns in the working set (in this model, "geographical contiguity" occurs when two market towns lie within a distance of 2f of one another).

TRANSPORT-ACCESS MATRIX

	THE BASIC REGION							Outside Basis; Inside Country		Outside Country		
	M_1	M_2	M_3	....	....	M_n	$(c/p)_B$	T_{oB}	$(c/p)_{oB}$	T_{oc}	$(c/p)_{oc}$	Σ
M_1	---	M_{12}	M_{13}	....	....	M_{1n}						Tl_1
M_2	M_{21}	---	M_{23}	....	....	M_{2n}						Tl_2
M_3	M_{31}	M_{32}	---	....	....	M_{3n}						Tl_3
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
M_n	M_{n1}	M_{n2}	M_{n3}	....	....	---						Tl_n

M_{ij} = 1 if towns i and j are linked by a transport route of not more than two modes

M_{ij} = 0 otherwise

$(c/p)_{iB}$ = s if town i lies on a transport route which, via not more than two modes, enters a city and/or port within the basic region; s= number of cities and/or ports

$$Tl_{ij} = \sum_j \delta_{ij} + (c/p)_B + T_{oB} + (c/p)_{oB} + T_{oc} + (c/p)_{oc}$$

APPLICATION TO MALI

1. Selecting the Critical Crops

In this case, we have, following the UNECA recommendations, selected groundnuts (G), rice (R), and millet/sorghiem (MS) as the critical crops. That is,

$$C_1 = G$$

$$C_2 = R$$

$$C_3 = MS$$

2. Selecting the Basic Set of Regions

The "Economic Importance Relation" for Crops

(1) $$a_1G = a_2R = a_3MS$$

Marginal rates of substitution:

(2) $$MRS_i = \frac{p_c cal_i + p_p pro_i}{p_i^e}$$

$$(i = G, R, MS)$$

The data for the linear program is:

a. FAO recommended targets:

calories per-capita per day = 2400

protein/grams per-capita per day = 33.4

(source: FAO, Calorie Requirements, FAO Nutritional Studies No. 15, Rome: 1957, page 47. FAO, Protein Requirements, FAO Nutritional Studies No. 16, Rome: 1957, page 36. These figures correspond to

the FAO recommendations for that class of countries to whose environmental properties those of Mali most closely approximate)

b. percent of Malian "average" diet consisting of (G + R + MS) = 70%

(source: Based on Ivory coast diets; in USDA/ERS, Food Balances for 30 Countries in Africa and West Africa, 1959/61, Washington, March, 1965, page 24.)

c. therefore, $\lambda_c = 1680$, $\lambda_p = 23.4$

d. cal/gram G = 2.00

cal/gram R = 3.58

cal/gram MS = 4.50

pro/gram G = 0.10

pro/gram R = 0.07

pro/gram MS = 0.20

(source: Charlotte Chatfield, Food Composition Tables, FAO Nuitritional Studies, No. 11, Rome: 1954, pages 10-13.)

e. domestic prices:

$$p^d_G = \$0.00012$$

$$p^d_R = \$0.00018$$

$$p^d_{MS} = \$0.00026$$

(source: 1965 mean cooperative prices, Government of Mali, Annuaire Statistique, 1965, p. 123).

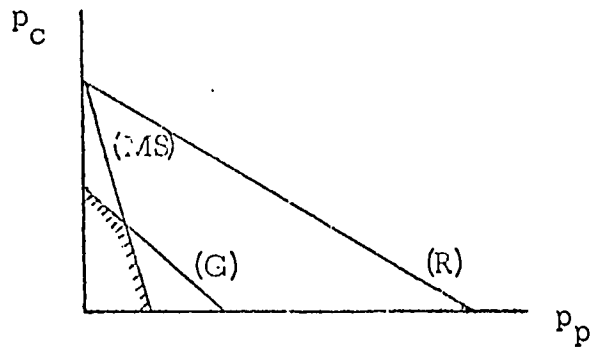
The three constraints are, therefore:

$$(G): \quad 2.00\, p_c + 0.10\, p_p \leq 0.00012$$

$$(R): \quad 3.58\, p_c + 0.07\, p_p \leq 0.00018$$

$$(MS): \quad 4.50\, p_c + 0.20\, p_p \leq 0.00026$$

Graphing these, we see that the G and MS constraints are binding,



and the solution is an interior one. We therefore change these into equalities and solve them simultaneously, yielding the shadow prices of a calorie and a protein-gram:

$$p_c = \$0.00004$$

$$p_p = \$0.00040$$

The 1965 f.o.b. export prices per metric ton for G, R, and MS are \$1080, \$118, and \$135, respectively.

(Source: FAO Trade Yearbook, Vol. 20, 1966)

Substituting this data into expressions (2), we have:

$$MRS_G = \frac{.00004\ (2 \times 10^6) + .0004\ (1 \times 10^5)}{1080}$$

$$MRS_R = \frac{.00004\ (3.58 \times 10^6) + .0004\ (7 \times 10^4)}{118}$$

$$MRS_{MS} = \frac{.00004\ (4.5 \times 10^6) + .0004\ (2 \times 10^5)}{135}$$

or,

$$MRS_G = 0.11$$

$$MRS_R = 1.45$$

$$MRS_{MS} = 1.92$$

Export importance:

(3) $$G = \left(\frac{1080}{118}\right) R = \left(\frac{1080}{135}\right) MS$$

$$G = 9.2\ R = 8.0\ MS$$

Consumption Importance:

(4) $$G = \left(\frac{120}{171}\right) R = \left(\frac{120}{260}\right) G$$

$$G = 0.70\ R = 0.46\ MS$$

Estimating the $\{a_i\}$ in expression (1):

$$a_1 = 1 + 0.11 = 1.11$$

$$a_2 = 9.2 + (1.45 \times .70) = 10.22$$

$$a_3 = 8.0 + (1.92 \times .46) = 8.88$$

$$1.11\ G = 10.22\ R = 8.88\ MS$$

or,

(5) $$G = 9.2\ R = 8.0\ MS$$

Indicator A (equations (6))

Region	% of National Production of G	% of National Production of R	% of National Production of MS	1965 $\overline{IA}$
Kayes	19.5	$+ (\frac{1}{9.2} \times 2.3)$	$+ (\frac{1}{8.0} \times 13.8) =$	21.5
Bamako	48.5	$+ (\frac{1}{9.2} \times 5.3)$	$+ (\frac{1}{8.0} \times 20.7) =$	51.7
Sikasso	17.0	$+ (\frac{1}{9.2} \times 11.0)$	$+ (\frac{1}{8.0} \times 25.2) =$	21.1
Ségou	12.5	$+ (\frac{1}{9.2} \times 53.8)$	$+ (\frac{1}{8.0} \times 19.9) =$	20.8
Mopti	2.5	$+ (\frac{1}{9.2} \times 27.6)$	$+ (\frac{1}{8.0} \times 20.3) =$	8.0

(Source: Ministère d'Etat Chargé du Plan et de la Coordination des Affaires Economiques et Financières, Annuaire Statistique 1965 de la République du Mali, Bamako: 1966, page 36.)

Indicator B (equations (7))

Region	Capacity Utilization in G-Land	Capacity Utilization in R-Land	Capacity Utilization in MS-Land	$\overline{IB}$
Kayes	.19 +	$\frac{1}{9.2}$ (.22) +	$\frac{1}{8.0}$ (.23)	$\frac{1}{\Sigma} = 4.1$
Bamako	.18 +	$\frac{1}{9.2}$ (.22) +	$\frac{1}{8.0}$ (.23)	$\frac{1}{\Sigma} = 4.3$
Sikasso	.14 +	$\frac{1}{9.2}$ (.22) +	$\frac{1}{8.0}$ (.15)	$\frac{1}{\Sigma} = 5.4$
Ségou	.47 +	$\frac{1}{9.2}$ (.22) +	$\frac{1}{8.0}$ (.32)	$\frac{1}{\Sigma} = 1.9$
Mopti	.19 +	$\frac{1}{9.2}$ (.22) +	$\frac{1}{8.0}$ (.25)	$\frac{1}{\Sigma} = 4.1$

(Source: Imputed from Annuaire, page 34, and from ECA, Op. Cit., page 135, using rice as numeraire).

Indicator C (equations (8))

Region	Rural Population Density per 100 km^2 1965 =	$\overline{IC}$
Kayes		419
Bamako		626
Sikasso		972
Ségou		1089
Mopti		763

(Source: Annuaire, page 38.)

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Equations (9) are:

$$\bar{I}_{KAYES} = 21.5d_1 + 4.1d_2 + 419d_3$$
$$\bar{I}_{BAMAKO} = 51.7d_1 + 4.3d_2 + 626d_3$$
$$\bar{I}_{SIKASSO} = 21.4d_1 + 5.4d_2 + 972d_3$$
$$\bar{I}_{SEGOU} = 20.8d_1 + 1.9d_2 + 1089d_3$$
$$\bar{I}_{MOPTI} = 8.0d_1 + 4.1d_2 + 763d_3$$

A set of weights d_i reflecting our objectives and adjusting for dimensional commensurability might produce the following ranking (if we could estimate d_1, d_2, and d_3, then this ranking would be <u>cardinal</u> instead of ordinal, as here): [Bamako > Sikasso > Kayes > Segou > Mopti]. Arbitrarily selecting the best three, then the basic set of regions = {Bamako, Sikasso, Kayes}.

3. <u>Selecting the Working Set of RGC's</u>

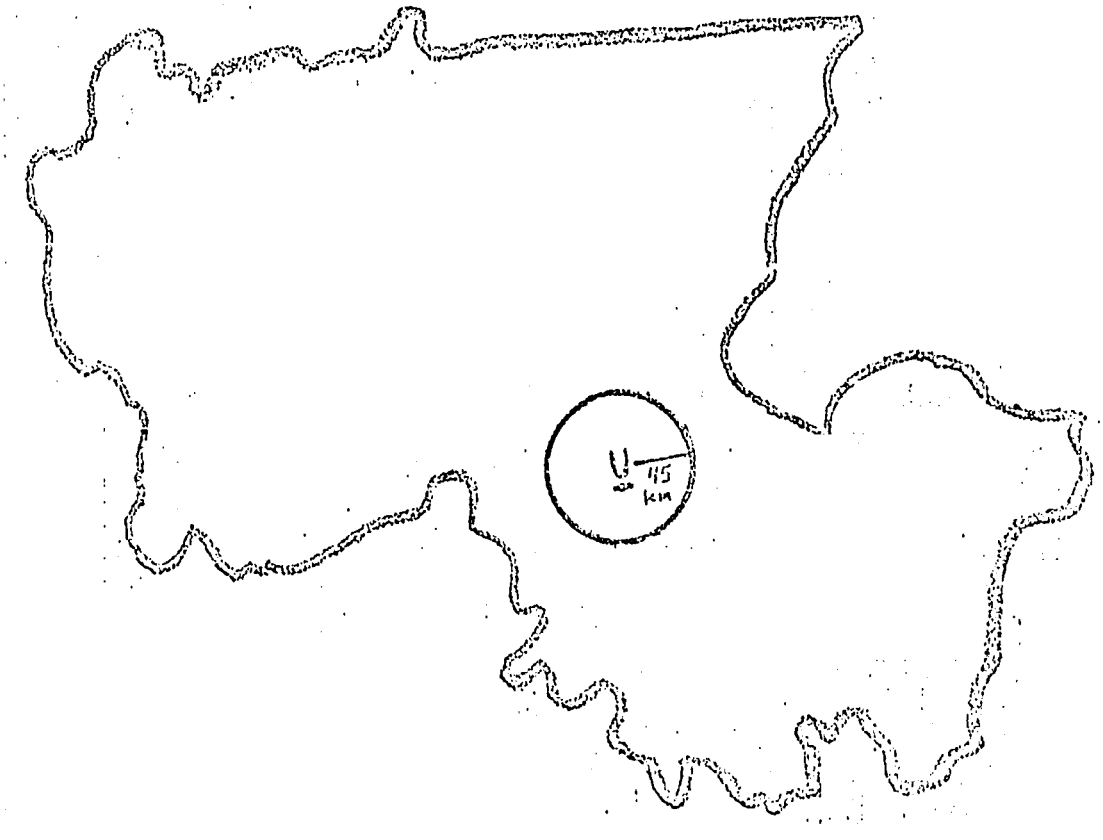
Given the information contained in the transport-access matrix below (based upon Maps 1-3), the ranking of the twenty towns is as follows:

4, 6, 7, / 13, / 2, / 11, [skip 12], 15,

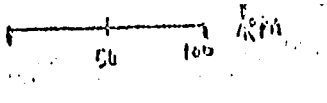
16, / 17, 18, 19, 20, / 8, [skip 9], [skip 10]

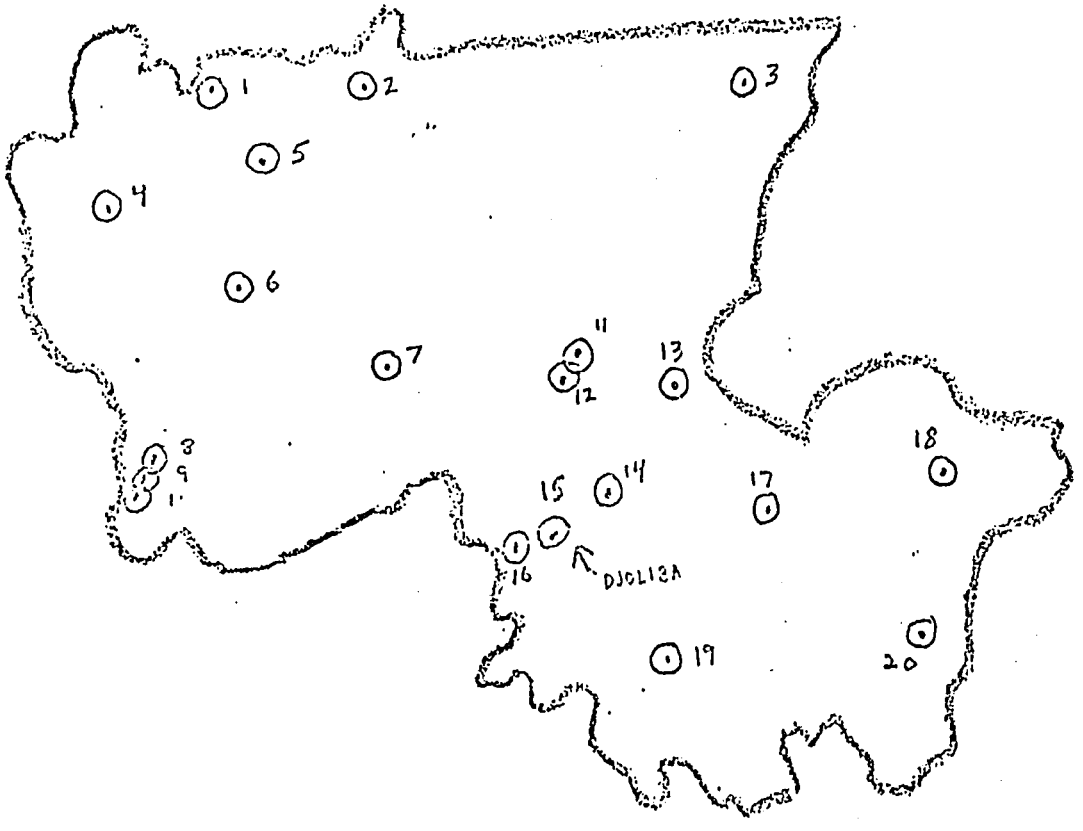
The regional demarcations are shown by slashes in the above list. They are, respectively, Kayes/Bamako/Kayes/Bamako/Sikasso/Kayes. Therefore, the "best" towns in each region, i.e. the working set, are {4, 13, 17}, or Kayes, Djoliba, and Bougouni.

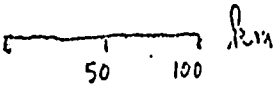
MALI



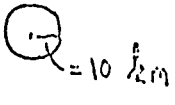
MALI: MAP 1



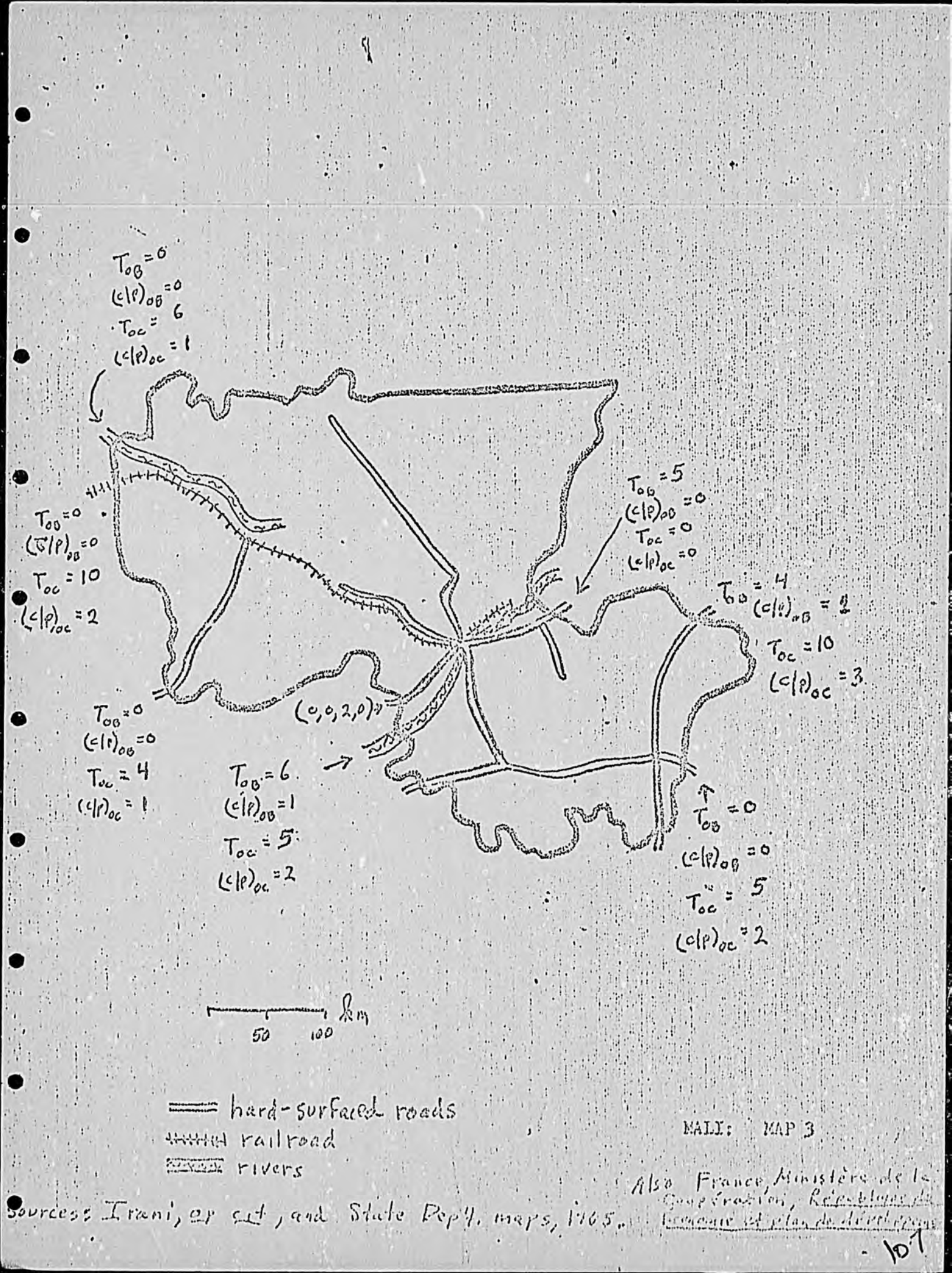




MALI: MAP 2



source: République du Mali, Ministère du Plan et de l'Economie Rurale, Rapport sur le Plan Quinquennal de Développement, 1961 - 1965, p. 28.



MALI: MAP 3

Sources: Irani, op cit, and State Dep't. maps, 1965. Also France, Ministère de la Coopération, Répertoire de l'armature et plan de développement

Naive Transport-Access Matrix For Mali (1965)

PLANNING WORK SHEET
APO-REN-2693

The Basic Region

	M_1	M_2	M_3	M_4	M_5	M_6	M_7	M_8	M_9	M_{10}	M_{11}	M_{12}	M_{13}	M_{14}	M_{15}	M_{16}	M_{17}	M_{18}	M_{19}	M_{20}	$(c/f)_s$	T_{OE}	$(c/p)_o$	T_{OC}	$(c/p)_c$	Σ
																					(Outside Basis, Inside Country)		(Outside Country)			
M_1	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_2	0	—	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	15	2	32	9	72
M_3	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_4	0	1	0	—	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	2	42	11	87
M_5	0	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_6	0	1	0	1	0	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	2	42	11	87
M_7	0	1	0	1	0	1	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	2	42	11	87
M_8	0	0	0	1	0	1	1	—	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	14	3	24
M_9	0	0	0	1	0	1	1	1	—	1	0	0	1	0	0	0	0	0	0	0	1	0	0	14	3	24
M_{10}	0	0	0	1	0	1	1	1	1	—	0	0	1	0	0	0	0	0	0	0	1	0	0	14	3	24
M_{11}	0	1	0	1	0	1	1	0	0	0	—	1	1	1	1	1	1	1	1	1	1	15	2	32	9	72
M_{12}	0	1	0	1	0	1	1	0	0	0	1	—	1	1	1	1	1	1	1	1	1	15	2	32	9	72
M_{13}	0	1	0	1	0	1	1	1	1	1	1	1	—	1	1	1	1	1	1	1	1	15	2	42	11	87
M_{14}																										
M_{15}	0	1	0	1	0	1	1	0	0	0	1	1	1	1	—	1	1	1	1	1	1	15	2	32	9	72
M_{16}	0	1	0	1	0	1	1	0	0	0	1	1	1	1	1	—	1	1	1	1	1	15	2	32	9	72
M_{17}	0	1	0	1	0	1	1	0	0	0	1	1	1	1	1	1	—	1	1	1	1	15	2	32	9	72
M_{18}	0	1	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	—	1	1	1	15	2	32	9	72
M_{19}	0	1	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	—	1	1	15	2	32	9	72
M_{20}	0	1	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	—	1	15	2	32	9	72

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Part II: MATERIALS FOR RGC CASE STUDIES

Part III: MATERIALS FOR RGC PLANNING

Journal Abbreviations

IDR = International Development Review

EDCC = Economic Development and Cultural Change

JRS = Journal of Regional Science

IJAE = Indian Journal of Agricultural Economics

IJE = Indian Journal of Economics

JFE = Journal of Farm Economics

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