LINKAGES AND AN ECONOMIC STRATEGY FOR THE SAHEL

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The end of starvation is not the beginning of prosperity. As the agricultural problems of the Sahel gradually come under control, perhaps even with occasional bountiful harvests and price declines, unemployment, poverty, and misery may nevertheless continue. People who eat reasonably well may still be unhealthy, ignorant, badly housed, ill clad, and lacking a variety of comforts and necessities for developing their interests. To reduce poverty further, their economies must move away from exclusive emphasis on agriculture toward non-farm rural employment in small-scale industries, construction, social services, and work in secondary towns. Most economies of the world have already gone through this process, sometimes smoothly but usually in a desultory or even chaotic and incomplete fashion. Much has been learned about the process, and countries of the Sahel can adapt this expereience to accelerate their own development.

A useful concept in planning and anticipating the diversification of economies is that of "linkage." Economic activities do not proliferate in isolation from one another but are linked in a variety of direct and indirect, simple and complex ways. Skill in planning and forecasting lies in singling out the major linkages and understanding thoroughly how they function as possible engines of growth.

Demand linkages lead to the establishment of new industries as income grows per houshold in the pursuit of prevailing occupations. The"income elasticity of demand" is the ratio between the percentage growth of demand for a particular product or service and the percentage growth of income. If the relative prices of goods and services change, that elasticity will be modified by the cross-elasticity of demand or the way a percentage change in relative prices affects the volume of relative sales. Mere proliferation of the number of households will also raise demand and help to bring about the time when a new industry becomes viable. The word"industry" is used broadly here, not just as "manufacturing." An industry that can get along with a small market or volume can obviously be established earlier than one that is subject to great economies of scale.

By bringing in scale, a supply phenomenon, we have already conceded that the changing composition of economic activities cannot be deduced from demand linkages alone. Even the possible changes in relative prices, mentioned above, are likely to reflect some aspect of changing conditions of production, or supply. The broader question,therefore, is which economic activities can and should survive and be encouraged in the face of foreign competition or that from other regions within the Sahel? With the answers to that question one can go on to <u>supply linkages</u>, the local materials, components, services, etc., that a new industry makes possible.

To put the problem in perspective, let us note which industries in general would have the least chance of being established in a secondary Sahelian town. Those with the most chance will have the reverse characteristics. Capital-intensive industries with sophisticated, rapidly changing technology and great economies of scale obviously do not belong. Products of a standardized character that are wanted throughout the world and that can be shipped at a low price (cents per ton) are more of a threat than hard-to-ship fragile goods adapted to local peculiarities of taste and climate. Products based on materials lacking in the Sahel are more likely to be imports than those based on local minerals and crops.

The linkages relating to agriculture are the most important but will not be pursued in detail here since other MSU papers have done that. Needed are warehouses and small plants to store and process the output. Production, storage, and repair facilities for modern inputs are also crucial. Noteworthy especially are the iron components of animal traction equipment that will need the services of blacksmiths, who, in turn will need charcoal. At one time fuel for sparsely settled areas was simply collected deadwood from the brush. The spread of rubbertired donkey carts / and better cutting tools has accelerated a process of deforestation that even includes stripping of smaller trees near densely populated areas. Thus we have a negative linkage or feedback to crop cultivation. Before the OPEC-induced price rise, charcoal prices had risen so much that bottled gas was beginning to be a viable fuel in some parts of the Sahel. Now deforestation has resumed. Linkages to other small industries like baking and brickmaking will accelerate the process.

Forestry

In Upper Volta eight percent of the area has been set aside as "classified forest," and a Bureau of Waters and Forests is supposed to regulate cutting. A German-financed project is exploring the possibility of reforestation in order to provide harvests of timber for construction and fuel. A United Nations expert, J. E. Raeder-Roitzsch, has recommended that better management of 250,000 acres of remaining forest is most needed. Some 25,000 reforested hectares could grow trees for lumber with a 40-year cycle, and 50,000 reforested acres could grow firewood with an 8-10 year cycle.[1]

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1 J. E. Raeder-Roitzsch, "Problemes Institutionnels de la Sylviculture dans la Region du Sahel," UN ST/SSO/32, Ougadougou, March 28. 1975.

Another expert, J. C. Delwaulle, states that irrigated forests should be planned along rivers near Tombouctou, Gao, Niamey, and N'Djamena, primarily for fuel. According to him, plantations elsewhere would cost 150,000 CFA per hectare (about $600) with a yield hardly better than natural regeneration. A better strategy would be to exploit correctly the timber on existing wooded ranges."[2] However, introducing better

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2 J. C. Delwaulle, Directeur du Centre Technique Forestier Tropical Niger/Haute Volta, "Le Role du Forestier dans l'Amenagement du Sahel," Niamey, March 1974.

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forestry practices into the attitudes, values, and customs of Sahelians may be more difficult than introducing the trees. In areas with only 350 to 600 mm of rainfall, only Acacias seem to be useful trees. Beyond 600 mm, the typical zone of Upper Volta, possibilities exist for such species as neem, dalbergia sissoo, albizzia lebbeck, prosopis chilensis,

and above all, eucalyptus (camaldulensis, tereticornis, alba, and crebra). After 700mm these are joined by cassia siamea, khaya senegalensis, calicedrat, nere, and anacardier, which yields an almond-like fruit. The possibilities of eucalyptus are currently being studied at Kava and Dedougou . Perhaps no linkage in the Sahel is more important than this one from forests to fuel, construction materials, and the desertification of croplands. It leaves no sector unaffected.

Mineral Extraction

Another sector that initiates chains of linkages early in development is mineral extraction. Stone, clay, gravel, and sand are dug up for local use and have such a low value per ton that imports cannot compete, not even those from one part of a country to another. Other minerals have a high value per ton or pound because they are not widely dispersed throughout the world and yet widely demanded. Gold, diamonds, and oil are outstanding examples. Noteworthy in the Sahel are phosphates in Mauritania and Senegal, iron ore and copper in Mauritania, Uranium in Niger, and manganese in Upper Volta. As transportation systems improve, more and more of these and other deposits will be developed.

As settlements grow around new mining towns the primary linkage goes via the demand side and is generated by the miners and associated management. Structures have to be built. The services of traders, doctors, policemen, etc. will be needed together with those of tailors and repairmen. Artisans may begin making pots, furniture, simple tools, clothing, and souvenirs for returning expatriates. Outside of devout Moslem regions, a boomtown atmosphere may develop and bring in saloonkeepers, prostitutes, and gamblers. Their services have a small market in the geographical sense.

Early Manufacturing and Infrastructure.

As might be expected, the Sahelian countries with their sparse populations and low per capita income levels are still in the stage of setting up infrastructure and the earliest types of manufacturing industries. Without power, communications, and transport, the manganese deposits of northern Upper Volta are literally not linked to their markets and cannot be developed. Cotton ginning, extracting vegetable oils, tanning hides, and making leather products are logical forward links from agriculture and have already taken place. Forward linkage to processing of sugar and rice depend on the prior establishment of irrigation infrastructure in river valleys for these crops and often the eradication of diseases, onchocerciasis, trypanosomiasis, malaria, and schistosomiasis -- all now under attack. The time for modern dairies and pasteurization is probably not far off.

Other manufacturing is likely to be simple, but without complex backward linkages within the country and primarily making those light consumer goods that even poor people can afford: soap, cigarettes, matches, soft drinks, and beer. Together with leather products (shoes) and textiles, these can already be found in the capital cities of the Sahel. Depending on distance and population size, they may follow to some secondary provincial marketing towns.

Basic Industries and Light Engineering

Until basic industries that supply several others can be set up, linkages will be too few to seem like a network. Ultimately, most manufacturing industries sell materials and components to one another and make up a densely linked web. Fascination with this process led to its excessive promotion through tariffs and subsidies in Latin America, South Asia, and some other countries, like Turkey. The typical results have been inferior per capita income growth rates (below 2 percent annually), capital intensive economic enclaves, income inequality, and balance of payments problems.[3] Linkages are worth noting and helpful, but economic development consists of more than that.

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3 Hollis Chenery and M. Syrquin, Patterns of Development 1950-70 (Washington: World Bank, 1975). pp. 20-21, 200-207.

One type of easily viable basic industry that supplies several other activities is the making of construction materials. The need for lumber has already been mentioned. A better roof is high on the list of priorities of Sahelians since hard rains quickly damage traditional covers of thatch, mud, and sticks. Currently they are replaced by beams and rafters, from coastal forests, covered by corrugated iron sheets, also imported. For some types of buildings volume may be sufficient for factory producing of bricks, ceramic tiles, concrete blocks, and possibly cement. Use of cheap local materials and low technological sophistication often obviate the need for import protection or subsidies. The same applies to furniture and clay utensils, but these should not be mechanized at the expense of a viable local handicraft "informal" sector, as seems to have happened in the case of a Niamey furniture plant.

Another type of linkage that can tie a new plant to several older activities involves the packaging of their products. The packaging may involve cloth bags, paper cartons, or glass bottles. Local fibers can be used for the bags and paper, while glass primarily takes sand and fuel. Here economies of scale take on considerable importance and the temptation of premature stimulation through protection arises. It is not, however, true that the further backward a linkage extends, the more likely are formidable scale requirements.[4] Fuel is likely to be a problem in the Sahel.

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4 Albert Hirschman, "The Political Economy of Import-substituting Industrialization," Quarterly Journal of Economics, Feb. 1968.

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but waste from agriculture -- rice hulls, sugarcane bagasse, peanut shells, and perhaps certain grasses can foster packaging industries.

Some chemical industries can be considered early as suppliers for many other activities. Perhaps the rather mechanical mixing and packaging of paint, pesticides, and pharmaceuticals can be put in this category. Some fertilizer plants can use local phosphates and other minerals. Electrical batteries are another possibility.

Light engineering or metalworking activities usually begin as repair shops for railways, automobiles, mining equipment, and the like. Some artisans may also begin making ducts, railings, and a variety of implements and components. Simple equipment follows, and in Upper Volta the assembly of bicycles and motorcycles has begun. Equipment like pumps can follow, but importing disassembled equipment with much separate packaging can easily be more expensive than importing entire units.

Limits to Manufacturing Linkages

Sparsely populated countries that are located far from trade routes cannot expect to have the same amount of growth of manufacturing with all its linkages as larger countries. Lack of volume will delay the establishment of many basic metals, chemical, rubber, paper, and other industries. The industrial share of GNP of a country with 5 million inhabitants producing $400 per capita will only be equal to that of a country with 40 million people at the $200 per capita income level. In other words, at 2.5[a] percent growth rate, smaller countries are likely to lag by about 28 years in industrialization because they lack the volume for a minimum scale plant.

Since the small countries are likely to manufacture half as much for themselves, they will have to import twice as much as large ones at given per capita income levels, typically between 20-30 percent of national product. Exports must pay for those imports, and if the import share does not decline, exports must grow at the same rate as national product. Rather, without longterm foreign loans or assistance, the national product of small countries cannot grow faster than their exports. World imports of primary products, however, have generally grown at no more than a 3-4 percent annual rate.[5] Countries, like those of the Sahel, that cannot easily shift to non-primary goods exports are likely to stagnate and to experience emigration. The phenomenon is not unique to the Sahel. Within the United States, areas like the high plains or Michigan's Upper Peninsula have been too remote and too sparsely settled for an industrial take-off.

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5 Chenery and Syrquin, op. cit., p.89.

Services

Workers who find no jobs in agriculture, mining, manufacturing, or construction will be unemployed or in services. At Sahelian income levels, about 6 percent of national value added will be in capital-intensive public utilities and 34 percent in other services. Altogether this 40 percent should involve about a quarter of the labor force. Some are there because of demand and supply linkages to other economic activities; but others may be in retail trade or various personal services simply as a residual way of spending their time and eking out whatever income is possible. Which is which is hard to sort out, but some attempts have been made.[6] Presumably, if full employment could be attained, all the purely residual jobs would be abandoned.

A major type of service is government work. In Upper Volta the economically active population was 2.8 million in 1973, and of these only 17,600 were government workers in 1971. Nevertheless, this was 49 percent of what might be called formal sector employment. The proportions are similar in other Sahelian countries with the exception of Senegal where the formal sector had 9 percent of employment. Only 23 percent of these were government workers. Senegal is different because it is not landlocked and because its capital, Dakar, was once the capital of all French West Africa and therefore less constrained by limited volume than are the capitals and industries of the fragmented States of today.[7]

6 A.S.Bhalla, "A Disaggregative Approach to Employment in Less Developed Countries," Journal of Development Studies, Oct. 1973.

7 Michael Cohen, "Urban Growth and Economic Development in the Sahel," Washington: World Bank, Sept. 1976 (mimeographed), p. 48.

The linkage of government work to the rest of the economy is partly as needed input and partly, to be blunt, parasitic. Governments can hire because they can collect taxes. If other sectors fail to grow, government cannot take the lead. On the contrary, the excessive growth of government employment with disproportionate salaries may have retarded the growth of secondary towns and therefore the agricultural sector and GNP as a whole. Michael Cohen concluded in 1976 that "it is highly unlikely that public sector employment will increase rapidly in the future."[8]

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8 Ibid, p. 51.

Since then Cohen has suggested in conversation with the writer that, perhaps, the great stress on assisting the Sahel from abroad will cause a second upward ratchet in government employment, incomes, and subsequent multiplier effects. Anything is better than nothing, but this type of injection may not stimulate the economies most effectively.

Forecasting the Effects of Linkages

The reason for studying linkages is to accelerate development. At times, lack of a linked activity may stall the progress of a related economic cluster and be a "bottleneck." At other times, the somewhat precocious installation of a strategic economic branch may make the simultaneous or later installation of others easier . Whether or not this process should be "balanced" or "unbalanced," whether "technological" or "pecuniary" externalities are involved, and with what sorts of "shadow prices" the results should be appraised, made up much of the development literature of the 1950's.

Eventually linkage effects were incorporated in cost-benefit analysis for projects and input-output analysis for entire economies. The input-output approach tends to treat the economy as an engineered mechanism with a matrix of set links that can be represented mathematically as fixed coefficients. Perhaps the major question that can be answered with this model is, how long can the economy keep growing with its current structural characteristics (the coefficients) unchanged? What activities will reach capacity limits as demand expands in accordance with income elasticities? When will imports exceed exports by intolerable amounts?

As shortages develop, prices of output types do not change in this type of model, causing substitution among factor inputs with repercussions throughout the economy. Nor will consumers respond by rearranging the composition of what they demand. "Structuralists" have accepted these assumptions as realistic and concluded that rigid supply conditions and a low price elasticity of demand may

paralyze development. For example, no matter how much the price of food, transport, electricity, and imports rises, people will not buy less and more cannot be readily produced. Consequently, inflation must be expected and government intervention should be sought.

Recent empirical work has shown these assumptions to be unfounded Substitution elasticities are significant. In a pooled time series and cross-section analysis for 15 developing countries, Richard Weisskoff found (for example) that a 2.5 percent rise in relative food prices would keep food consumption unchanged in the face of an overall income rise of 2.0 percent.[9] On account of such substitution

9 Richard Weisskoff, "Demand Elasticities for a Developing Economy," in H.A. Chenery, et. al., eds., Studies in Development Planning, (Cambridge: Harvard University Press, 1971)

effects, most input-output matrices will be obsolete within five years, certainly within ten. Small and poor economies, such as those of the Sahel, not only have poor data, but each additional firm is likely to be not incremental, but a quantum shift in the economic structure. Highly useful results for a detailed investment strategy that exploits linkages are unlikely from tour-de-force Sahelian input-output models. This is not to say that modified models may not be useful for other purposes.[10]

10 Dudley Seers, "The Use of a Modified Input-Output System for Zambia," in I. Adelman and E. Thorbecke, eds., Theory and Design of Economic Development, (Baltimore: Johns Hopkins, 1966)

At the Workshop on Analysis of Distributional Issues organized by the World Bank at Bellagio, Italy, in April 1977 participants agreed that big, computable, general equilibrium models are of less use for the actual detailed numerical results that they churn out than as a means for organizing thoughts on economic policy. Their main function is to bring out the implications of assumptions and institutional circumstances. As often as not, when complex models give counter-intuitive results, one had better reform the model than one's perspective on an economic situation. Neither rigid input-output models nor neo-classical models with fairly smooth price adjustments can analyze the dynamic results that follow discrete policy shifts from an initial disequilbrium position.

> In future research the emphasis should be shifted away from multisector general equilbrium models to building ad hoc sectoral, regional and industry, as well as labor market, models, integrated with each other, if felt necessary, through a small macro-economic model. In gathering, analyzing and presenting data, a social accounting matrix framework that keeps different models of production distinct may be more useful than traditional national income accounting and input-output frameworks.

With its study of agricultural production, credit storage, marketing, and nutrition, the MSU group organized by Professor Carl Eicher is already using this approach. A similar cluster has been studied in the form of small industry by Professor Carl Liedholm. The interrelation between health, sanitation, and new settlements has comparable possibilities. Settlements should be related to the need for both sites and lumber, a use that competes with the need for charcoal. Studying linkages at this intermediate level will allow the most useful types of forecasts, those that may guide intermediate

range policy decisions.

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