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**SOCIOLOGICAL ISSUES IN THE
DESIGN OF CANE-GROWING SYSTEMS^{1/}**

by

A.H. Barclay *

* Research Fellow, David Livingstone Institute of Overseas Development Studies,
University of Strathclyde, Glasgow, Scotland.

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* The consecutively numbered references in the text are to the notes attached at the end of the paper.

This paper considers the sociological dimensions of agricultural policy within the African sugar industry. Its starting point is the assumption that the form and content of the raw material supply system - that is, the growing of sugar cane - are integral aspects of sugar technology. Technical and economic decisions with regard to scale and methods in the processing phase are intimately linked to decisions about how to secure the requisite quality and quantity of cane from the area in which a factory is sited. From this it follows that the ways in which the industry relates to the land and population which sustain it constitute a crucial element in technology assessment.

The core of this discussion is a comparison between peasant and plantation (estate) agriculture in the production of sugar cane. (In the current terminology of the sugar industry, peasant producers are commonly known as "outgrowers".) There are two elements in the comparison. The first of these is essentially technical, and concerns the potential for maximizing productivity per unit of land and ensuring a steady supply of cane to the factory. The second is situational, and deals with the compatibility of each type of organization with the specific environment in which the industry must operate.¹ Here the analysis of compatibility focuses on socio-economic and institutional phenomena, and thereby contributes to a determination of environmental soundness and appropriateness for the agricultural component of the sugar industry in Africa.

It must be emphasized that the peasant/outgrower mode of production, as analyzed in this paper, does not include large-scale, privately owned farms. Although such units exist in certain areas, they are assumed to be outside the mainstream of rural development planning in Africa to-day. The dominant thrust of agricultural policy is towards a redistribution of incomes and a broadening of opportunities for the poorest members of rural communities. In this respect the central question to be addressed here is whether from a development point of view these goals are better served through mass participation in the sugar industry as wage laborers or cane-growers; that is, as proletarians or as producers.²

I. A Model of Cane Supply Systems

In the production of sugar cane a series of operations must be performed, but the techniques used may vary according to the scale of production and the mode of agricultural organization. The design of a cane supply system for a given area and a given milling capacity involves several choices. In relation to overall rural development planning, the crucial questions in the design process concern the degree of mechanization, the proportion of cane to be grown on a central plantation, and the proportion of the total land areas committed to sugar cane. Figure I provides a representation of possible combinations, with a vertical axis indicating the extent of plantation-based cultivation, and a horizontal axis showing the degree of mechanization.

Interpreting the vertical component is a straightforward matter: the points on the scale indicate the percentage of total cane tonnage produced on a factory-owned or managed estate. For the horizontal component, a simplified interval scale from 0 to 4 is employed. A score of 1 is assigned for each of the following operations that has been fully mechanized: 1) land preparation, 2) weeding cultivation, 3) harvesting, and 4) loading and transportation of cane to the mill. Thus a system in which all of the above operations involved labor-intensive methods would be scored 0; one in which all operations except harvesting were performed mechanically would be scored 3, etc.

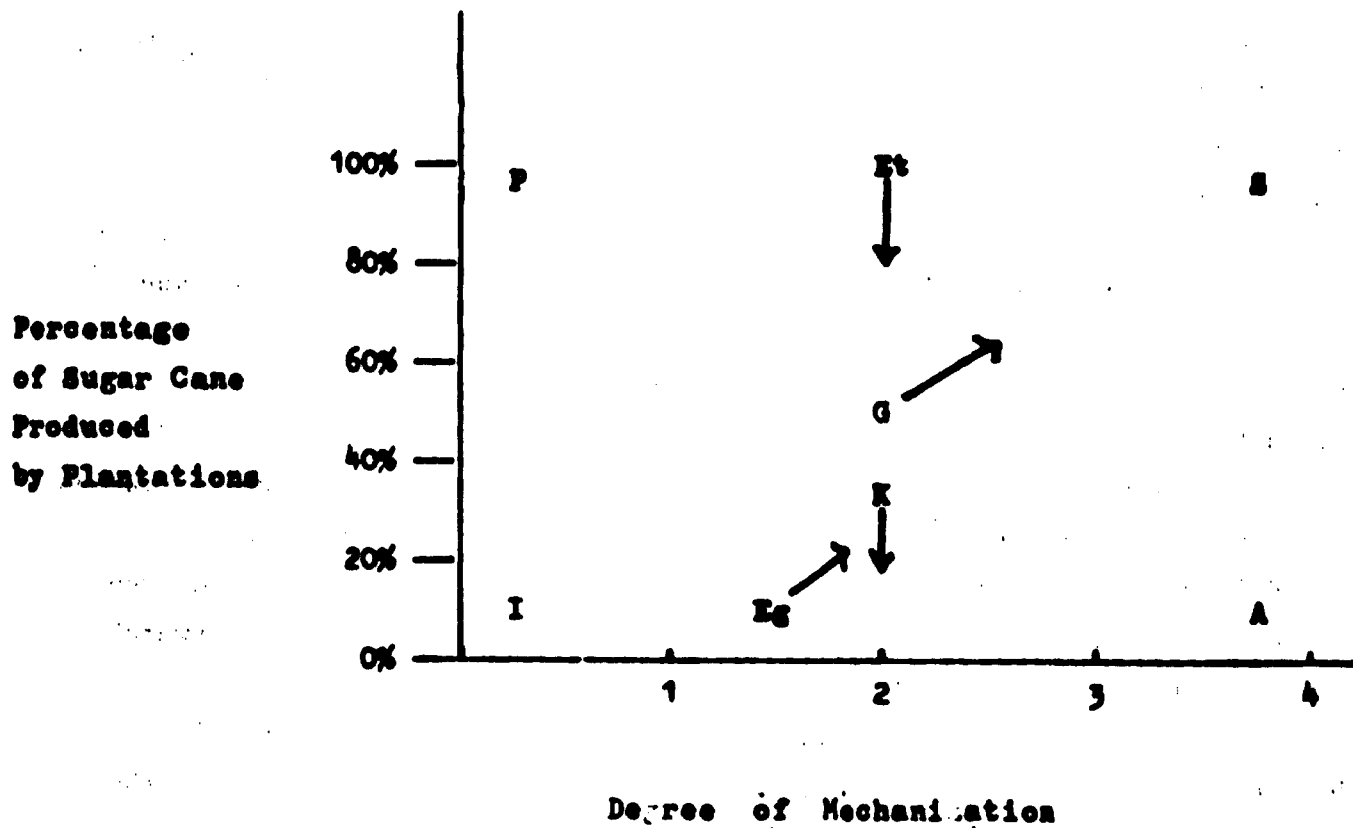
It is possible to draw numerous examples from the sugar industry in various countries, and to plot all of them on this matrix. For the purpose of clarity we will restrict ourselves to a few, including those from countries in which field data were collected for the UNEP/UNIDO projects.

- In the lower left corner, I indicates the present system used most in parts of India;

- In the lower right hand corner, J indicates the type of cane supply system currently used in Queensland, Australia;³

- In the upper left hand corner, P shows the type of organization used in the past by many sugar plantations in the Caribbean region;

FIGURE I: A Model of Cane-Growing Systems



- in the upper right hand corner, S represents the type of system introduced fairly recently into plantation areas where labor shortages have encouraged full mechanization.

Additionally, the four African countries that have been visited may be located on the matrix. As the model is intended to be dynamic, a vector is attached to each of the four, indicating the probable direction of future policy with respect to the method and organization of cane production. The coordinates for the two axes appear in parentheses for each country.

E signifies Ethiopia (100%, 2.0), where hitherto all cane has been grown on plantations, with land preparation and cane transport fully mechanized. Peasant cane growing on either a cooperative or communal basis is to be promoted in the future, as the vector indicates; further mechanization is not planned at present.

Eg signifies Egypt (2%, 1.5), where smallholders have produced almost all cane; cane transport is done by rail; and some but not all of the cane land is prepared by tractor. The vector represents current experimentation with mechanical planting and harvesting equipment and estate-based cane production.

K signifies Kenya (33%, 2.0). The percentage of plantation cane varies from one project to another within the country, but the vector shows the trend in recent projects towards a greater reliance on outgrowers. The degree of mechanization is comparable to the Ethiopian situation, and a "rightward" shift on the matrix does not appear likely in the near future.

G signifies Ghana (50%, 2.0). The percentage of estate cane given here represents an average between the values of approx. 40% and 60% for the two existing vacuum-pan factories. Mechanization corresponds to Ethiopian and Kenyan practice, but the vector indicates current interest in mechanical harvesting and the possibility of a greater role for estate cane in new projects.

These examples serve to illustrate the general framework within which policy is made, and the effective boundaries of choice for two major policy issues. They do not, however, indicate why specific decisions are made, and the remainder of this paper examines this subject with reference to the model presented above.

II. Plantation Agriculture: Advantages and Limitations

From a strictly technical viewpoint it is essential for a sugar factory of any size to secure a reliable supply of cane. The "solution" to this problem, in many parts of the world where the industry has been introduced, has been to centralize control as fully as possible over both land and labor. Until the 19th century this approach was carried to its logical extreme, with slave or indentured laborers being used within the framework of a "pure" plantation economy⁴. Historical, economic and political forces effectively destroyed this labor system, and will certainly prevent its reconstruction. Nonetheless, plantations have survived in one form or another, and in the case of sugar cane production they continue to hold certain attractions for the processes.

In his comparison of peasant and plantation agriculture, Watters has argued that the latter has several intrinsic advantages:

As a result of its larger capital resources, larger unit area, centralized management, high degree of specialization and planned development, it provides a sounder basis for increasing production. It usually has a greater capital input per acre, adopts readily the latest research findings, employs advanced technology and tends to rationalize all stages of production.⁵

These features are descriptive of plantation agriculture in general, but in the case of sugar the perishability of the crop adds force to the argument. A common saying within the industry is that "sugar is made in the field, not in the factory": that is to say, efficient processing depends on an adequate quality and quantity of cane arriving at the factory gate precisely when required. The logic of centrally controlled cane production holds strong appeal for planners concerned with the viability of large-scale projects. Because vast amounts of capital are to be invested in such projects, the possibility of underutilized capacity due to shortages of cane is conceived as a serious threat. Joint management of factory and plantation - the "land-and-factory combine", as it is sometimes described - is advocated by some multinational firms in the industry as an answer to this potential difficulty.

The theoretical advantages of the plantation are not the sole concern of the policy-maker, however, for he must also assess its compatibility with the total situation in which it is to operate. This point was emphasized by Watters in his discussion of the Fijian sugar industry, where he identified

social, cultural and political factors promoting resistance to plantation agriculture, in the form of a vigorous smallholder system. The point is equally relevant to the future prospects of the sugar industry in Africa, because it embodies a concern with socio-economic appropriateness.

In present-day conditions the availability of land is a crucial consideration in the possible establishment of a new plantation. Virtually nowhere in Africa can land be considered a "free good", as it was in the early phase of imperialist expansion and colonization in Western Hemisphere. Edgar Thompson, a sociologist who has written extensively on the subject of plantations, described them as "institutions of settlement" in their initial stages, and other students of Caribbean and New World societies have used the same classification.⁶ Sugar plantations were created in situations of "open resources"⁷, where land could be claimed or conquered relatively easily, and then populated by immigrant groups of planters on the one hand, and slaves, or indentured labourers on the other. These conditions clearly do not apply to contemporary Africa, however.

We may consider two scenarios for land acquisition which are fairly typical in African countries, and which contrast with the "open resource" setting of the classical New World plantations. In either type of African ecosystem, the introduction of a major agro-industrial project is certain to have complex and far-reaching effects.

In situation a), cane has to be grown under irrigation, and the area required for a plantation consists of drylands in semi-arid river valley. The area has not been previously cultivated, but has served as grazing land for the livestock of pastoral population. (Though often described as nomadic, many such groups have regular, seasonal patterns of migration and the river forms the core of their existence). Pastoralism, in this situation, represents a long-term adaptation to the seasonal scarcity of water. Irrigation holds the promise of altering these conditions, but it is directed towards specialised commercial agriculture, and not towards the continuation of pastoralism. And yet the latter is the usual entirely understandable preference of the affected population.

Land acquisition may be a straightforward procedure in this type of situation, particularly where the government holds the power of eminent domain. The affected group then faces a difficult choice: either to try to adapt a drier environment further away from the river (in which case pastoral subsistence becomes increasingly marginal, and vulnerability to drought is greater), or to abandon pastoralism in favor of participation in agriculture as wage laborers or as peasant smallholders. In neither case is the transition likely to be smooth, and one may fairly conclude that when left to their own devices - as is usually the case - pastoral groups become victims rather than beneficiaries of irrigated agricultural development projects.

In situation b), where cane can be grown on a rainfed basis, land acquisition poses a different set of problems. Usually it is long-established sedentary agriculturalists whose land is needed. Depending on the density of population and the prevailing system of land tenure, it is possible in theory to find new settlement sites outside the alienated area, allowing the affected landholders to continue farming activities. Varying kinds of compensation may be offered, including alternative land for settlement, cash payments, or a combination of the two. The financial costs of such direct compensation may be included in the budget for a new sugar project, or may be borne by the government of the country concerned.

From the vantage point of plantation and factory managers it is the evacuation of the land that matters most. Yet the process of resettlement tends to be far more complex in practice than in theory. Even where compensation has been relatively generous, relocation, obtaining rights over new land, and setting up new homesteads pose serious difficulties for many families. The experience has repercussions beyond the immediate sphere of land tenure, for it disrupts existing patterns of reciprocity and social interaction between neighbors and kinsmen, and these are not easily recreated in new surroundings, especially when previously neighboring households have been separated in the course of resettlement. Moreover, the successful resumption of economic roles is by no means automatic, particularly for marginal peasant farmers.

The coming of the sugar industry changes their entire social and economic environment. Like everyone else, they must try to fit themselves into new systems of relationships, yet the experience of displacement and resettlement hinders their efforts to adapt.

The case of the Mumias sugar project in Western Kenya provides an illustration of the problem associated with situation b). A detailed study of the land acquisition for the project was carried out by the author in 1974, prior to the current UNEP/UNIDO study. Cash compensation had been paid to approximately 1,000 family heads who were former registered (freehold) owners of land acquired for the nucleus estate of the Mumias Sugar Company, Ltd. Data from a sample of 296 displaced landholders revealed that in the absence of a specific policy to assist resettlement, cash compensation for land and crops tended to be rapidly exhausted. Although virtually everyone in the sample had invested in new plots of land, rights of ownership had been secured by only 17% fully two years after moving. This effectively excluded the remaining 83% from participation in the company's outgrowers program, and thus from the benefits of higher income accruing to peasant cane growers. (The results of the Mumias resettlement study will be presented in greater detail in the final report of the U. EP/UNIDO study. Here it may be remarked that the comparatively generous amount paid in compensation afforded the opportunity to study a "best case", in which inability to pay for new land was not a factor).

What is common to both situations is the involuntary nature of displacement. A plantation is by definition a consolidated land unit, so evacuation by its prior inhabitants becomes a necessity, not an option. Increasingly, African governments have taken cognizance of the problems arising from the enforced displacement of human populations. Assessment of the true "social cost" of land alienation, as we have argued, is a complex exercise involving a range of phenomena, not all of which are quantifiable. While calculations based only on a theoretical replacement cost for land convey the illusion of simplicity, they are reductionist and may actually mislead the policy-maker. It is no accident that the advocates of "feasibility" for major projects who offer such calculations tend to be far removed from direct responsibility for resettling large rural populations.

In the light of actual experience with such programs, many governments are now reluctant to set aside land for new plantations. Thus situational constraints outweigh the purely technical justifications for reproducing the plantation system in African conditions.

The labor requirements of plantation agriculture are another dimension of the situation. Several general characteristics may be enumerated which bear directly or indirectly on policy for the sugar industry in both existing and future projects:

1) Regimentation: to the extent that field operations are labor-intensive, they tend to require constant, close supervision. Thompson characterized this as "military agriculture",⁸ while R.T. Smith portrayed the plantation as³ "bureaucratically organised system in which whole blocks of people are treated as units and marched through a set of regimentation under the surveillance of the small supervisory staff."⁹

2) Status and Class Differentiation: the typical plantation has a clear-cut system of stratification, and the institutional structure serves to maintain a high degree of social distance between wage workers and the managerial elite. Describing a large sugar estate in Jamaica, G. E. Cumper wrote:

The mobility between different levels of the system is slight, and the authority system therefore tends to be reinforced by a rigid system of status which extends outside the economic area of the worker's life.....the tendency to give central housing to skilled and supervisory workers produces a roughly concentric distribution by authority and economic level, which reinforces the status system by giving it visible expression.¹⁰

Racial segregation (a legacy of slavery, and one of the lynchpins of colonial society and economy) was another attribute of the plantation system. Legal measures taken by most Third World governments have eliminated this attribute, but the hierarchy of stratification has tended to remain intact.

3) Income and Purchasing Power: Wage rates for unskilled field laborers are generally fixed on a piece-work or task basis. Unionization provides a basis for periodic negotiations leading to marginal increases in these rates, but real incomes are likely to remain static, if they do not actually decline, in a population wholly dependent on wages from this type of employment. On such a plantation community in Puerto Rico was described by the anthropologist Sidney Mintz as:

almost uniformly landless, propertyless (in the sense of income-producing property), wage earning, store buying and corporately employed. They differ little in their resources and share an inability to change fundamentally their economic resources and share an inability to change fundamentally their status. 11

4) Seasonality: The demand for unskilled labour on sugar cane plantations varies with the length of the harvesting milling season. Typically the off-season, or "dead season", as it is known throughout the Caribbean, is a time of hardship for casual and seasonal workers in the sugar industry. They must find alternative means of subsistence, either on smallholdings, if they possess land, or in occupations outside the industry,¹² or (conveniently, from the industry's point of view) if they are temporary migrants they may be repatriated to distant home areas until the next season commences.

The fact that these characteristics are mutually reinforcing serves to explain an apparent paradox in plantation agriculture: namely, its vulnerability to "labour shortage" even when operating in a labour-surplus economy. It is suggested here that the nature of the plantation's social and economic organisation generates resistance and an active preference for alternative means of subsistence that objectively exist. Thompson identified the "most insistent problem" of plantation-based agriculture as follows: the institution is "full of people who, in spite of all rules, regulations, punishments and rewards insist upon behaving like human beings".¹³ Clearly a calculation of opportunity costs for labour in this model of agriculture must encompass non-monetary criteria, for the acceptance or rejection of employment at a given wage rate will be influenced by job and status mobility, perceptions of relative deprivation, the scope for individual expression in the work to be performed, and related factors. The cumulative impact of the characteristics listed above makes it difficult for plantations to compete with alternative types of employment, even where the latter offer lesser monetary rewards to the labourer.

Manual harvesting of cane, which in theory has the greatest capacity to absorb surplus labor, is consistently faced with the greatest problems in recruiting sufficient manpower.

III. The Role and Significance of Outgrowers

As an alternative to plantation systems, we may consider the prospects for outgrower cane production in contemporary African conditions. Here the difficulties associated with the introduction of what is usually a new cash crop cannot be minimized. Wide variability in performance by small-scale producers (as measured in yields per hectare or in net income) is to be anticipated, as compared with the predictable uniformity of centrally-managed estates. The dispersal of cane growing onto small, non-contiguous units of land represents a step towards the devolution of economic power, but this justification is situational - that is to say, it embodies a particular trend in rural development policy - rather than technical. In the latter regard, the smallholding is comparatively less promising as a vehicle for increasing productivity. Unlike the plantation, it is not ordinarily run as a business venture devoted to the accumulation of capital.

Policy is never made in a vacuum, however, and outgrower systems appear to be well suited to a variety of situations, given the necessary commitment on the part of governments. Not only does the dispersal of cane growing not displace the human population inhabiting the area, but it offers them a role to play (as producers) within the new sugar economy. In each of the following cases small-scale production of sugar cane could be actively promoted:

- 1) where the aim of policy is to retain and stabilize existing land tenure arrangements; or
- 2) where a land reform programme is being undertaken involving the distribution of land previously concentrated in large holdings; or
- 3) where new areas (notably through irrigation schemes) are being opened up for settlement and agricultural utilization.

The incidence of these situations varies considerably from one African country to another, with the first probably being the most common. In all cases, however, the main thrust of agricultural development planning is to

integrate peasant farmers more fully into the market economy as producers of a cash crop. The organizational basis on which they participate in that economy may take different forms, depending on the political orientation of the government and the institutional structure existing in rural areas. Thus cooperative societies, individual contracts between growers and factories, and communal farming of sizeable blocks of land have all been deemed appropriate in specific African settings.

Sugar cane tends to be an especially remunerative crop for the grower (whether an individual or group of peasants farming communally), but only insofar as it is a raw material destined for a specific market. Grower and processor are necessarily interdependent, and to some extent their interests come naturally into conflict and must be resolved. Ferguson's paper on the Queensland sugar industry considers this question in depth; some features of the African sugar industry, which confronts somewhat different issues, may be briefly reviewed here.

Recently instituted outgrower schemes within large-scale African projects have been characterized by tight centralization and control. Factory-oriented cane growing demands comparatively high investment in the crop, and the application of "scientific" methods, including a prescribed number of weeding and the use of specified chemical fertilizers. Justifications for close supervision relate to the factory's needs: the supply of cane from the peasant farm sector must be reliable, and to make it so the mode of cultivation, it is argued, should emulate the techniques developed on plantations. In this framework the successful smallholdings/in affect, "plantations ^{become} in miniature", to use a phrase coined by Watters for the Fijian sugar economy.¹⁴ An extension service and credit system (operated either by the factory or an auxiliary organization) may be used to support cane production and further reduce uncertainties at the milling stage. The Mumias sugar project in Western Kenya provides an apt illustration of how a large vacuum-pan factory can fully utilize capacity - and, indeed, exceed production targets - while drawing most of its cane from outgrowers.

In assessing the implications of this pattern we must distinguish between different levels of analysis. Changes in quantitative indicators - for example, in the monetary value of marketed output - may be cited as proof that factory-directed agricultural intervention is the surest way to bring about sustained rural development.

Thus in conditions where sugar cane enjoys a comparative advantage over other crops, specialisation and commercialisation are treated as evidence of a successful "transformation" in peasant agriculture.

It would seem, however, that the replication of "plantation in miniature" on peasant farms dissipates the principal developmental advantages that the latter normally possess, particularly the capacity for diversification. According to Watters, these may be summarised as follows:-

the smallholding is a more flexible unit, being less dependent on distant markets and relatively unencumbered by large investments in fixed capital equipment. Moreover, it could provide the growing local market with many food and industrial crops that are now imported.¹⁵

The "transformed" smallholding, being dependent on a single crop, does not fulfil this potential; on the contrary, it signifies a de facto drift towards the monoculture in the cane-producing zone, even outside the boundaries of plantation.

The normal justification for introducing a cash crop into a peasant farming system is that it will provide an income to supplement subsistence production, thereby leading to an improvement in living standards. The difficulty with factory-dominated cane growing is that it tends to substitute a new mode of cultivation for the pre-existing mode. Typically, the new mode includes land preparation by tractors, improved (heat-treated and disease-free) seeds, chemical fertilizers, and mechanized transport of the harvested crop to the factory gate. By contrast, the pre-existing technology (which in some instances may even have been applied to "local" varieties of cane used for chewing or processed into syrups), has usually been based on hand tillage or ox-ploughing, limited applications of manure (and these would by no means be universal, since they depend on the ownership of livestock), and ad hoc marketing practices. Yields tend to be low and the proportion of output committed to the market is small. With the advent of commercially-oriented cane farming, a wide gap quickly appears between the technology and investment applied to sugar cane and to other crops. One sector of agriculture proceeds to flourish - benefiting from ongoing agronomic research and technical supervision - while the other stagnates. Even when land has been formally reserved for food crops, productivity in the subsistence sector may actually decline, and planted acreages diminish, because other factors of production (particularly labour) become increasingly costly and scarce.

Evidence from sugar-producing areas suggests that these problems can arise in either of two situations: 1) where the size of the market for cane (i.e. the milling capacity of the factory or factories serving the area) remains constant, or 2) where the demand for cane grows due to expansion of existing mills or the erection of new ones. (The second situation is now much more common, and the design of most new vacuum-pan factories explicitly allows for an expansion of capacity). An explanation is usually to be found in the comparative advantage that cane enjoys over other crops. Theoretical computations which assume that all crops receive comparable inputs may be sufficient to demonstrate this advantage; in practice, where only sugar cane benefits from credit, close supervision, extension services, a guaranteed market, etc., the gap tends to be even wider.

At one level of analysis, it is possible to argue that uneven change manifested in localized monoculture has the effect of spreading benefits to areas outside the cane-growing zone. Regional interdependence would presumably be enhanced if cash incomes earned within the zone were partially utilised in purchasing food grown elsewhere. (In theory, sugar zones in African countries would be much less isolated from sources of food than, for example, the islands of the Caribbean or Mauritius.) Yet two major qualifications must be stated here. In the first place, this model, which presumes a multiplier effect in the expenditure of incomes, implies that cash-earning opportunities are evenly distributed within the cane zone in itself. These conditions would be difficult if not impossible to satisfy in practice: such factors as landlessness, the small size of holdings, infertile soils and poor drainage normally exclude some members of a peasant community from participation as outgrowers. When food has to be imported at comparatively high prices - and it is worth remarking that the markups involved in food distribution seem to exceed those for most other commodities - the effects of inflation will be felt by everyone, but those without regular incomes from cash crops tend to be hit the hardest. Secondly, the model assumes that benefits will be distributed fairly equitably in the wider area beyond the cane zone. This depends on the structure of formal and informal marketing institutions, and on the extent of stratification in the wider rural society.

In practice, a minority of entrepreneurs and speculators is more likely to benefit from such opportunities than the mass of small-scale producers of surplus food.

The typical pattern is therefore one in which the promotion of the new cash crop succeeds all too well. This result underscores the need for comprehensive planning in rural development; it is not, of course, an argument against the introduction of sugar cane as such. The question confronting planners and policy-makers is how to harmonize the obvious advantages of cane with the other requirements of rural populations, particularly the production of adequate supplies of food.

Although this question has not hitherto commanded great attention it seems certain to do so as the sugar industry continues to expand in African countries. The industry is, after all, quite young in most of these countries, and interest in including outgrowers within new projects had development comparatively recently. The evidence we have reviewed serves as a reminder that the introduction of a new cash crop into peasant areas represents only a partial solution to the problem of development. To achieve balance and diversification in context of growth, an holistic view of the rural economy must be incorporated into the planning process.

IV. Conclusion

The main focus of this paper has been on the difference between peasant and plantation agriculture in the sugar industry. It would be misleading to suggest that actual policy-making and project planning require complete acceptance of one system and rejection of the other. Many recent African Sugar projects have combined the two, in varying proportions. Several examples on the matrix in section I illustrate this tendency, in which outgrowers' cane supplements the output from a factory-operated "nucleus" estate. We may briefly review the factors influencing the evolution of policy in this sector.

As a general observation, it was noted that peasant cane-growing appears to be compatible with the developmental goals of African countries. And yet the examples cited in the model of cane supply systems did not exhibit a uniform tendency in favor of outgrowers system. In two cases, Kenya and Ethiopia, the vectors showed an increasing reliance on outgrowers with (in the short run, at least) only partial mechanization of agricultural operations. In other two cases, Ghana and Egypt, the possibility of greater mechanization was associated with

a potentially large role for plantation-based production. Although space does not permit a proper analysis of all the relevant factors for each country, some tentative conclusions may be drawn.

The divergence in policy observed in these cases may be explained with reference to recent experience with the availability of agricultural labor. The two countries in which further mechanization is being considered have encountered labor shortages, especially in harvesting operations.¹⁶ The irony of this situation, in which machines are sought to replace men in a general context of unemployment and under-employment, suggests a potential conflict between the successful continuation of large-scale sugar projects, once they are established, and the basic premises of rural development policy.

As the matrix in Figure I demonstrated, increased mechanization connoted a strengthening of the plantation sector rather than the kind of decentralization implicit in outgrower systems. In practice, it is difficult to make efficient use of mechanical planting and harvesting equipment on every small landholding; the introduction of such equipment creates pressures and incentives for consolidation of the land areas on which cane is to be grown. As a corollary, we would expect that the successful establishment and maintenance of cane production by peasant farmers would be dependent on the continued availability of unskilled manual labor, whether supplied by growers' families, communal work groups, or individuals hired on a casual basis. The trends in Kenya and Ethiopia, as represented on the matrix, reflect this assumption.

Actual decision-making requires a reconciliation of technical and situational criteria. This paper has shown how the ways in which land and labor are utilized in the production of sugar cane represent the outcome of such judgements. The policy-maker must, in the final analysis, assign weights to the two sets of criteria: decisions as to the socio-economic appropriateness of a particular agricultural system cannot be made independently of the technical considerations affecting the probable performance of the industry. Hopefully this discussion has illuminated some of the broader issues that have been implicit rather than explicit in the planning of sugar projects in Africa, and that deserve careful attention from decision-makers.

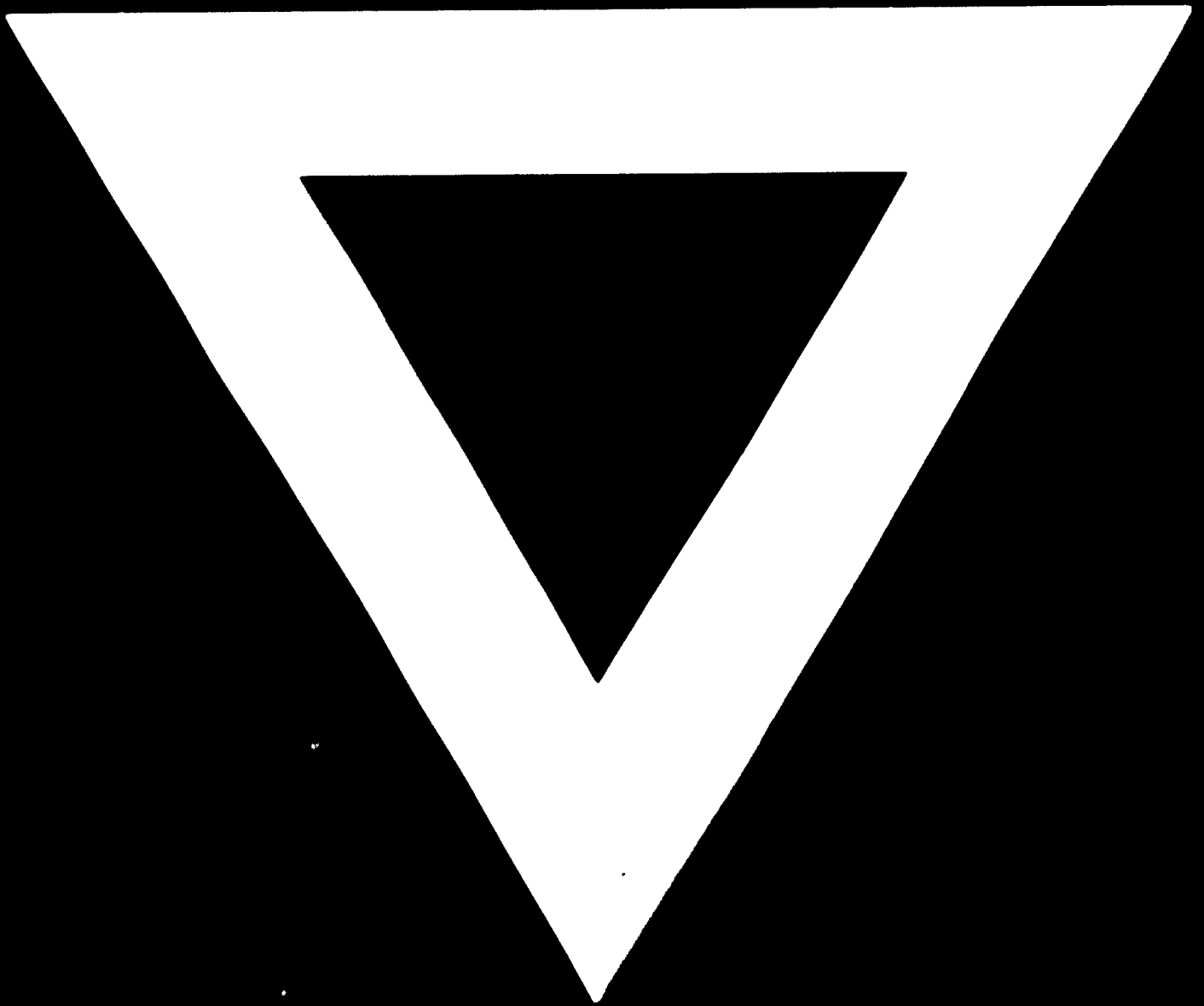
Notes

1. The distinction between technical and situational criteria follows the argument developed by R.F. Watters, "Sugar Production and Culture Change in Fiji: A Comparison Between Peasant and Plantation Agriculture", Pacific Viewpoint, March 1963, pp. 25-52.
2. This reference is to the potential for employment in the agricultural sector, and not in the processing phase of the sugar industry.
3. Two points should be noted about the Australian example: 1) mechanical harvesting, although now almost universal there, has been adopted only in the past 15 years; 2) although private growers supply virtually all cane to the mills, most of the growers have moderate to large landholdings and use capital-intensive methods, unlike the peasant producers of African and India. See the paper prepared for this seminar by G. Ferguson.
4. The concept was originally formulated by Lloyd Best, in an article entitled "Outlines of a Model of Pure Plantation Economy", Social and Economic Studies, Sept. 1968. An extended discussion may be found in G. Beckford: Persistent Poverty: Underdevelopment in Plantation Economies of the Third World, Oxford, 1972. For a comment on the limitations of this model, see Denis Bennis: "The Theory of Plantation Economy and Society: A Methodological Critique", Journal of Commonwealth and Comparative Politics, Nov. 1974.
5. Watters, op.cit., p.25
6. E. T. Thompson, Plantation Societies, Race Relations and the South: The Regimentation of Populations, Duke University Press 1975.
7. The concept is traceable to the work of H. Nieboer: Slavery as an Industrial System, The Hague, 1910, p. 386.
8. Thompson, op. cit., p.29
9. R. T. Smith: "Social Stratification, Cultural Pluralism and Integration in West Indian Societies", in S. Lewis and T.G. Mathews (eds.): Caribbean Integration, Puerto Rico, 1967.
10. G. E. Cumper: "Modern Jamaican Sugar Estate", Social and Economic Studies, Sept.1954, pp.153-4.
11. Sidney Mintz: "Cañamelar: The Subculture of a Rural Sugar Plantation Proletariat", in Steward, J. (ed.) The People of Puerto Rico, Urbana, Illinois, 1956; p.416.

12. Frederic Hicks: "Making a Living During the Dead Season in the Sugar- Producing Regions of the Caribbean", Human Organization, Vol.31, No.1, 1972.
13. Thompson, op. cit. , p. 29.
14. Watters, op. cit. , p. 38
15. Watters, p. 25.
16. The factors contributing to labor shortages in the Ghanaian and Egyptian sugar industries are substantially different, but these cannot be fully discussed within the framework of this paper.



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