The International Exchange and Testing of Cassava Germ Plasm in Africa

Proceedings of an interdisciplinary workshop held at IITA, Ibadan, Nigeria 17-21 November 1975

Editors: Eugene Terry and Reginald MacIntyre

Cosponsored by the International Development Research Centre and the International Institute of Tropical Agriculture
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Contents

Foreword  5
Participants  9
Welcoming Address, S. K. Hahn  11

Theme Papers
Possibilities for economic research into cassava production systems in Africa, J. C. Flinn  15
Improvement of cassava at the International Institute of Tropical Agriculture, S. K. Hahn  21
Cassava bacterial blight in Africa, E. R. Terry  23
Advances in research on the economic significance of the green cassava mite (*Mononychellus tanajoae*) in Uganda, Z. M. Nyiira  27

Country Presentations  31
Summary of General Discussion  35
Appendix 1  Agronomic aspects of the International exchange and testing of cassava germ plasm
Part A  Cooperative testing and selection  39
Part B  Germination and pollination  41
Part C  A rapid multiplication technique, A. K. Howland  42
Part D  Guidelines for the establishment of a cassava improvement project: the Zaire model, H. C. Ezumah, S. Kabonyi, K. Beya  45

Appendix 2  Phytosanitary aspects of the international exchange and testing of cassava germ plasm
Part A  Suggested guidelines relating to the international movement of cassava planting materials  51
Part B  Description and evaluation of cassava mosaic disease in Africa, E. R. Terry  53
Part C  Major pests of cassava in Africa and preliminary guidelines for screening of resistance, K. Leuschner  55

Appendix 3  A note on the IITA training program  57
Cassava is of as much interest to the economist as it is to the cassava breeder, physiologist, pathologist, entomologist, agronomist or food scientist working in the tropics. The economic importance and uses of the crop, the farming systems or regions in which it is grown, and its role in national markets or in international trade are discussed in April et al. (1974), Butler et al. (1971), Johnson (1963), Jones (1969, 1972), Nestel and McIntyre (1973), and Phillips (1973). The objective here is to suggest some areas of economic research in cassava production which are complementary to that of the biologist, or which are useful to policymakers and planners to assess the impacts and trade-offs of alternative strategies for increasing the production of the crop.

Some features of cassava of particular interest to the economist include: (a) it is grown in farming systems ranging from subsistence agriculture to highly commercialized systems; (b) it is produced using hand labour alone or with some aspects of production being mechanized; (c) it can be stored in the ground for long periods of time, but when harvested deteriorates rapidly unless processed; (d) depending on type, it may be consumed with very little or very extensive processing; (e) processing may be labour-intensive or capital-intensive; (f) marketing channels may be traditional, or may be highly integrated, large-scale operations; (g) the potential markets for cassava products are very broad, and include human consumption, animal consumption, medicinal purposes, and industrial uses.

Thus there are choices available related to systems of production, processing, and marketing of cassava. These choices involve technical, economic, and social decisions. When evolving improved cassava production systems, one must be concerned not only with the economic gains from the technology but with the distribution of these gains as well. Thus social goals, politics, and government policies cannot be divorced from the technical and economic criteria used, in part, to evaluate "relevant" systems of cassava production. Indeed, government policies and infrastructural arrangements are just as vital as the technology itself when the objective is to increase the marketed surplus of a commodity.

A simplified production system

To help focus the following discussion, a highly simplified cassava production system is presented in Fig. 1 together with a number of the more important factors (and their principal linkages) which will influence the structure, conduct, and performance of the system in reality. Each of these decision or intervention points provide foci for collaborative research between the economist and other workers. There is no suggestion that the economist would be the principal researcher in each of these groups; obviously in some cases, he would be supportive of the biologist (e.g. on the impact of environmental factors on cassava production), the political scientist (policies and institutions), or the sociologist (human factors), depending on the nature of the study. The important point is that there is a need for cooperative, integrated research between scientists of various disciplines if cassava systems, in their broader sense, are to be quantitatively understood.

Agroeconomic research

To a certain extent, the research undertaken at one point in time becomes the technology of the future which, by implication, will influence the future
Fig. 1. A simplified cassava production system.
viability and social structure of the agricultural sector. Thus, a case exists for cooperation between the agronomist and the economist in the continuum from identifying research priorities through to the eventual on-farm testing of the subsequent agricultural technology. OECD (1964), Fishel (1971), and Andersen (1972) discuss and provide extensive references related to the identification, execution, and interpretation of cooperative agricultural research programs. There are, of course, obvious areas where the payoff from biological research is apparent and does not call for the input of an economist (e.g. breeding for resistance to CBB, CMD). However, when considering other breeding objectives (e.g. time to maturity of the crop, quality and storage attributes) there are economic trade-offs which will influence the relevance of the breeder’s varieties to different target groups of farmers, processors, and consumers.

While the economist may interact with the plant breeder in defining breeding objectives (Ryan et al. 1974), he has a more obvious role when working with the biologist in defining the more economically important management factors that become components of the agricultural technology adopted by the farmer. For example, what are the economic combinations of inputs to use under various situations for “improved” cassava production? What are the appropriate methods of cultivation and land management? Which cropping systems are relevant to cassava production (e.g. sole versus intercropping, rotation sequences)? How often should the crop be weeded (hand weeding or chemical weeding)? How and when should the crop be harvested (hand or mechanically)? Valid solutions to these questions involve economic as well as technical and biological considerations, in addition to an appreciation by the researchers of the resource base of the farmer, his objectives, and management skills.

Cassava production systems

If researchers are concerned with identifying and solving problems of cassava production, it is necessary that they have a clear understanding of the role of cassava within farming systems. Also required are specifics of cassava production practices and how factors both within and beyond the control of the farmer impinge on his decisions to allocate his resources between cassava, other crops, and competing activities.

The quantity of cassava produced by a farmer, and the amount that he may be induced to produce in the future, will be influenced by a complex of: environmental factors limiting yields (incidence of disease, soil type, drought, etc.); the prices of cassava, other crops, and inputs; the relative yields of cassava and other crops; his resource base, including the level of technology available; his management objectives (profit motives, attitudes to risk, concern for producing a supply of food over time, etc.).

The above class of information is best collected through empirical studies of farming systems—facts, not impressions, must be assembled. These farm-level studies of cassava production systems should be undertaken with a view to: (a) describing and quantifying present cassava production systems in the more important cassava-producing regions of Africa; (b) determining the technical, biological, economic, and management relationships which exist between cassava and other crops grown by the farmers; and (c) determining the effects of environment (disease, soils, etc.) on the output of cassava production systems. Such studies are multidisciplinary in nature and, for maximum effectiveness, require the cooperation of the economist, biologist, and soil scientist.

The major payoffs from such studies, in addition to helping the researcher understand the system in which changes will take place, include: (a) specification of the problem areas in cassava production which should have priority in biological research; (b) specification of the problem areas which need to be tackled through changes in institutional and marketing systems; (c) identification of constraints by priority which, unless removed, will impede the adoption of improved cassava technology; (d) identification of technology with a high expected rate of adoption; (e) estimation of the impact of new technology in terms of both economic gains and their distribution between farmers; (f) helping to identify the target group for the extension effort in cassava production; (g) enabling planners to predict resources and prices (credit, fertilizer, planting material) required for new technology to be adopted by farmers; (h) estimation of future demands for cassava products.

Examples of farm-level studies of cassava production systems are: Diaz (1973), Ezelle et al. (1975), Pinstrup-Andersen and Diaz (1975), and Rankine (1972). Procedures and methodological issues involved in conducting farm-level production studies are found, for example, in Collinson (1972), Norman (1973), and Spencer (1972).

The present large discrepancy between biological or potential yield and economic yield (i.e. that portion of the cassava crop harvested by the farmer) suggests that if the price of cassava were more attractive, rapid increases in supply could be forthcoming. This, coupled with the advances being made by cassava breeders in identifying resistance or
tolerance to a number of the more important cassava diseases, suggests that future yields may not be the most important limiting factor to increased cassava production. Problems are likely to occur in the areas of processing, storage, and marketing.

Cassava processing systems

Studies have shown that, within traditional farming systems, labour requirements for processing cassava (often the woman's job) may account for a third or more of the total energy required to produce a consumable or saleable item (Cleave 1974). In consequence, if it were technically possible to increase cassava production at the farm level due to the research endeavours of biologists, would the traditional processing system (both on- or off-farm) have the capacity to process the increased output? Where would the bottleneck lie? Would it be in (a) transporting the roots to the processing site? (b) washing/peeling the roots? (c) grating or other handling of the roots? (d) fermenting or retting the roots? (e) drying the product (energy supply?)? (f) storing the processed cassava?

If the processing subsector of the cassava system is likely to represent the effective constraint on an increased supply of cassava products reaching the market, it must be quantitatively understood before a solution is sought through research. Here the economist should cooperate with the engineer and food technologist in specifying the capacity, capital, and operating costs of cassava processing equipment that is more attractive to the processor than that presently available.

The distribution effects of proposed technology for cassava processing require equally careful consideration (e.g., "mechanized" gari production). Industrial plants capable of processing over 40 tons of roots a day are on the market (e.g. the Newell Dunford plant: Anon. 1974). Others of an "intermediate level" of technology are available which process up to 4 tons of roots per day (e.g. the "FABRICO" and "PRODA" plants in Nigeria: Ngoddy 1974). It is likely that while the large, capital-intensive plants are extremely efficient from an economic viewpoint, they could also create mass unemployment in the traditional, labour-intensive production sectors. From both economic and social viewpoints, design criteria for cassava processing plants should permit more efficient labour productivity than traditional systems without creating unemployment. This represents a challenge for the food technologist and engineer.

Cassava marketing systems

If cassava production increases beyond the point required to meet the increasing demands of an expanding population, what may be the consequences from marketing and price viewpoints? Several workers have suggested that the demand for cassava products for human consumption is rather income-elastic in some countries of Africa, and quite income-elastic in others (e.g. Phillips 1973, p. 17), but that demand for cassava products is not very price-elastic (see Araullo et al. 1974 and Edwards 1974 for a review of industrial processing). Thus, in those countries where the income and price elasticities of demand for cassava are inelastic, if supply increases at a more rapid rate than does population it is possible that cassava prices may fall. The producer is then no better off than he was before he increased his production. Under such circumstances, programs aimed at increasing the national production of cassava above that required to meet the needs of an expanding population would have little chance of success, unless there was price intervention by government or unless alternative markets for cassava products were found. Thus in order for policymakers to assess the price effects of increased cassava production, and to estimate future demand, demand studies for cassava must be undertaken by marketing economists.

Other bottlenecks in the cassava system may be found in transport and marketing. Johnson (1973) and Jones (1969, 1972) described the marketing systems for cassava in Africa in general terms. However, despite the importance of the crop, there is little quantitative information available on cassava marketing in the traditional sector. In many countries in Africa transport is poorly developed and costly. Programs aimed at increasing production of cassava may be to no avail if transportation to markets is not available. We need to assess the capacity of the transport systems to handle increased volumes of cassava and other products, and to determine what modifications are required to enable products to be moved at low cost.*

Marketing margins in developing countries (the difference between the price received by the farmer and the price paid by the consumer) are said to be excessive, and middlemen apparently make large profits at the expense of the producer and the

* It must be pointed out, however, that roads and other improvements of infrastructure do not guarantee greater consumption of cassava. It is possible that improved transportation could subject heretofore isolated producers to competition from imported commodities or commodities from other regions.

18
consumer. Is this a fact, or is the nature of the cassava marketing system small-scale and high-cost in nature with the individuals providing services within the marketing systems, like the farmer, making modest incomes? Many marketing studies (Thodey 1968) suggest this is the case, but policymakers often argue otherwise. Obviously, work is required to measure the prices of cassava products, the volume of flow at various points in the marketing system, and the cost of providing such services before statements relating to the efficiency of the marketing systems can reasonably be evaluated. Such information will also help to evaluate the distribution consequences of alternative forms of cassava marketing (e.g., government marketing boards, produce marketing cooperatives, etc.).

Policy and planning

While political and social decisions will influence policies related to cassava production and marketing (e.g., objectives of self-sufficiency, the role of the public versus the private sector) it is important that the social costs and the distribution of the benefits (and penalties) from alternative policies are known to the policymaker. The micro- and macroeconomic studies already identified provide part of the information required by government to assess the relative merits of alternative means of achieving their food production objectives.

Once objectives have been defined it then becomes the responsibility of the planner, economist, and technologist to identify the nature of the institutions, policies, and programs which will most efficiently contribute to the attainment of the political objectives. Informed programs, whether they are in agricultural research, extension, input infrastructure, marketing, or pricing, cannot be formulated, or embarrassing consequences avoided, without a quantitative understanding of the various components and links within the cassava-based system.

Summary

When considering cassava improvement in Africa, it is vital that the components of cassava production, processing, marketing, and policy, be studied as an integrated system. The ramifications of a possible change at one point in the system may be magnified, dampened, or wiped out by a reaction or bottleneck in another. To understand the true consequences of an objective to increase cassava production at the farm level requires an understanding of the linkages between the various subsystems, a task which requires the cooperation of the biologist, social scientist, and planner. In general, cassava systems in many parts of Africa are not well understood or documented. Cooperative research projects should be initiated to reduce this gap in knowledge.

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