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# A STRATEGIC APPROACH TO AGRICULTURAL RESEARCH PROGRAM PLANNING IN SUB-SAHARAN AFRICA

By

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**BACKGROUND:** Recent studies have shown that agricultural research can have high payoffs in Africa, but impact depends on how well technology fits with evolving needs and capacity in the agricultural sector and the rest of the economy. Structural adjustment policies (e.g., market liberalization, currency devaluation)and political change are transforming user demands for new technology and the economic environment in which technology must perform.

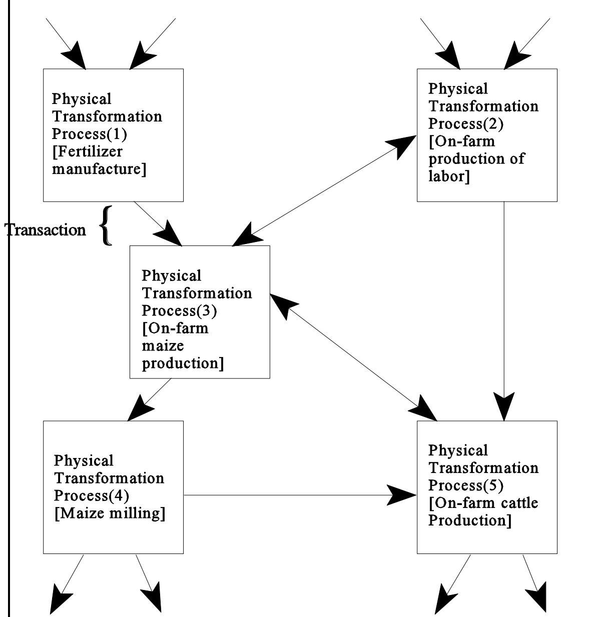
**OBJECTIVE:** The challenge is how to design agricultural research as a strategic input to promote broad-based economic growth, structural transformation, and food security in the increasingly market-driven, but fragile, economies of Africa. A process for designing agricultural research will have three distinctive characteristics: **1)** a **vision** that recognizes the link between research and agricultural transformation, including increased specialization and productivity in farming through the acquisition of science-based inputs from the rest of the economy in exchange for farm products. This implies the need for **2)** a **strategy** that ensures consistency and complementarity between technological change and improvements in institutions and policies necessary to foster greater integration and exchange within the economy, and for **3) tactics**, the development of feasible action plans, that bring together research clients and stakeholders.

**THE VISION.** Historically, every major country that has substantially improved real incomes has done so through a **structural transformation** of its economy. This transformation results in the generation of increasing proportions of employment and output of the economy by sectors other than farming. The economy becomes less agriculturally oriented in a relative sense, although farming and the food system continue to grow absolutely and generate important growth linkages to the rest of the economy.

Structural transformation also means a movement of the economy away from subsistence-oriented household-level production towards an integrated economy based on greater specialization, exchange and economies of scale. One implication of this process is that driving down the real cost of food to consumers requires fostering technical and institutional changes in the off-farm elements of the food system, as well as at the farm level. Another implication is that in order for structural transformation to go forward, the economy must develop low-cost means of exchange. High transaction costs in the economy can choke off structural transformation by making it too costly for people to rely on the specialization and exchange necessary to take advantage of the new technologies in the food system.

***The role of NARS in agricultural transformation.*** We start with the concept of a production-distribution-consumption sequence (PDCS) with two basic units of observation: physical transformations and transactions. Physical transformations are the result of combining two or more inputs to make an output, and they are linked by transactions. A portion of one PDCS is illustrated in Figure 1. Here, the outputs from fertilizer manufacture, the on-farm production of labor, and animal power and manure from on-farm livestock production are brought together in the production of maize. The maize grain and stalks

**Figure 1: PDC Sequence**




produced in turn are sold, given or traded as inputs to the subsequent production of maize meal, dairy or meat products, or additional on-farm labor. With each of these separable transformations, specialization by a separate individual or group of individuals is possible. These different groups are then linked by transactions. An economy can be defined as a system of interrelated PDCS.

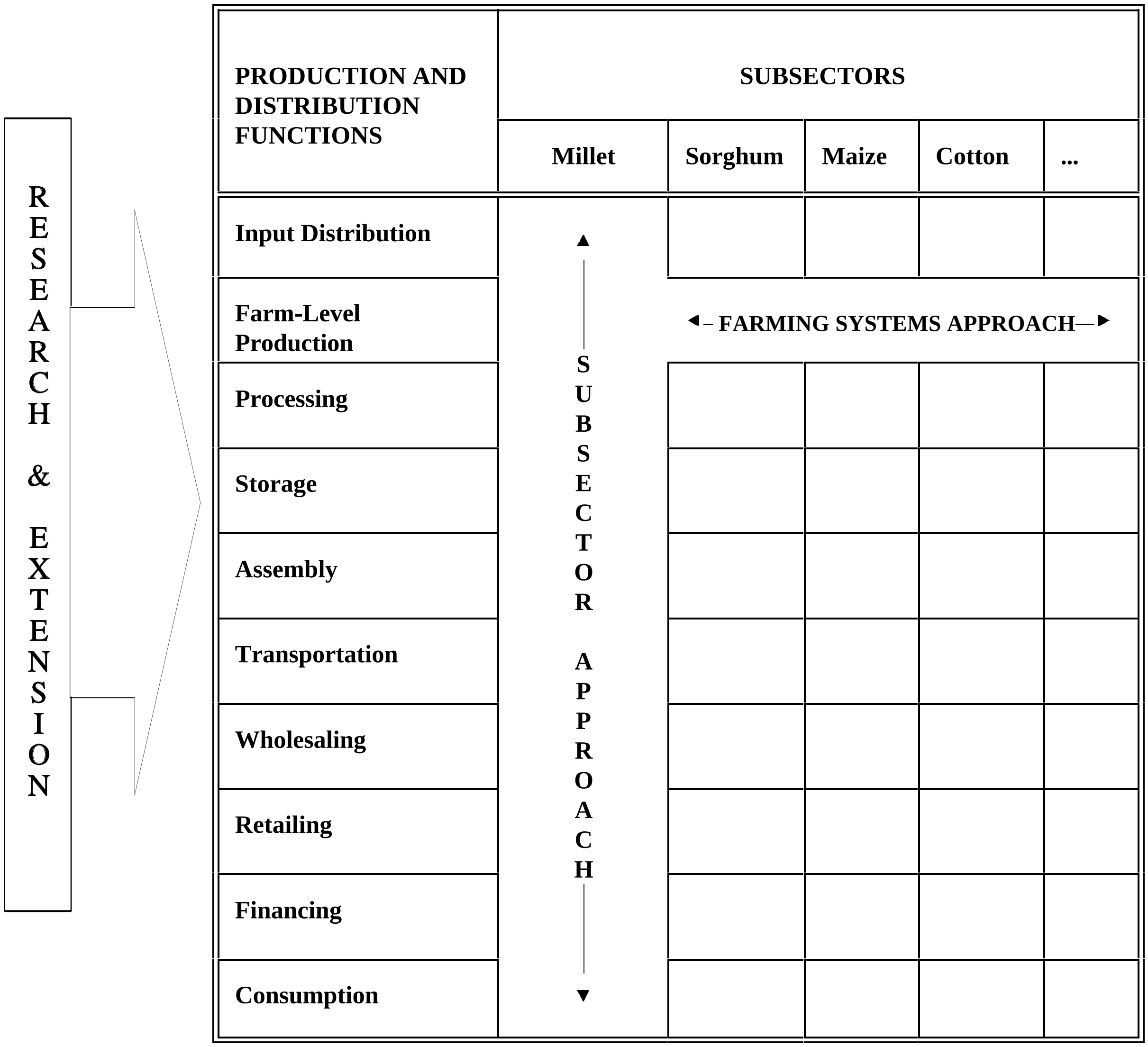
Facilitating structural transformation requires increasing the productivity of the food system PDCS. This can be accomplished in two ways: **1)** raising the productivity of the individual transformations in the PDCS through technological change, and **2)** improving the coordination among the individual physical transformations.

Increasing the productivity of individual physical transformations and improving coordination are, in practice, highly interdependent. For example, in much of the food system, physical transformations are time-dependent. Fertilizer applied at the wrong time in the growing season may lower rather than raise grain output. Thus, realizing potential productivity gains offered by the development of a new fertilizer-dependent variety requires adequate coordination between input providers and farmers.

***Operationalizing the vision***. In going from a broad mandate to an operational plan, the research organization must first define more precisely the aims of its research program and the assumptions underpinning it. *What weight will be given to different performance dimensions*? For example, will research focus on increasing the total value of agricultural output, regardless of where it is produced (an efficiency goal). Alternatively, greater weight may be given to increasing the productivity of crops grown by the poor (an income distribution goal). Strategic planning has to take into account the potential tradeoffs among these criteria and others such as the sustainability of natural resources.

*Defining the clients and stakeholders* for the research organization involves determining whose preferences count in the design of the research program. A client is an intended recipient of specific agency benefits. The tendency has been to think of farmers as the clients of agricultural research, but improving food security and food system performance requires increased productivity throughout the food system, not just at the farm level. This suggests that if the aim of agricultural research is to boost productivity in the food system, clients of the research include groups other than farmers, such as merchants, processors, input suppliers, and consumers.

The effective participation of this expanded set of research clients in the planning process is
key to making the selection of research priorities more market-responsive. Moreover, client and stakeholder networks constitute a potentially




powerful coalition that can support and monitor the implementation of research programs them selves. Just as important, they can identify and facilitate the implementation of institutional and policy innovations critical for adoption of technology.

The objective of strategic planning for NARS is to improve the probability that research resources will be invested where they will have a high payoff. The planning involves making educated guesses about where research will be most productive which, in turn, will depend critically on *what researchers assume about the political-economic conditions that will prevail in the future*. For example, whether the development of high-yielding, fertilizer-responsive varieties will have a high payoff depends in part on what is assumed about the future availability of fertilizer at the farm level. The strategic planning approach that we present assumes that agricultural researchers can influence how the future political-economic environment facing the food system evolves.

***The food system matrix and subsector analysis: tools for analyzing the food system***. In order to develop a workable research plan, researchers must come up with a way of describing and analyzing the food system in a manageable way. For example, one can visualize the food and fiber sector as a food systems matrix. The matrix is multi-dimensional, and can be viewed as a series of overlaid 2-dimensional matrices. Figure 2 shows one two-dimensional representation of the matrix, with commodities depicted as columns and various stages in the vertical transformation process depicted as rows.

Historically, agricultural research has focused primarily on problems that fall into individual cells—e.g., farm-level production constraints for millet. However, both farming systems research and subsector approaches address problems that span the various cells in the matrix and analyze how a coordinated approach to research on problems in different cells can increase the productivity of the technology development and transfer system. For example, research on urban consumption patterns for coarse grains may lead to insights about the attributes that breeders need to stress in their selection programs. Hence, research and extension need to address both physical transformations and the coordination among those transformations.

The food systems matrix identifies classes of important relationships in the sector viewed as a system. The matrix helps to identify questions and data relevant to evaluating the probable value of alternative programs of research and related programs, by directing attention to important relationships in the system likely to be influenced by the research. The matrix is also useful for identifying barriers to improved performance and unexploited opportunities, thus identifying potential opportunities for high-payoff research and complementary programs.

Subsectors are defined as the sequence of activities contributing to the production, distribution and use of particular commodities. A subsector is depicted as a vertical slice in the food systems matrix. The emphasis in subsector analysis is on descriptive diagnosis of potential opportunities and constraints in the vertical sequences in production and distribution and their coordination. The focus is thus on the coordination between stages, e.g., from the point where a commodity is produced on farms until it loses its identity in meals or in industrial processes. The analysis focuses on the vertically integrated processes of transformation and coordination throughout the subsector and on identifying problems and opportunities to improve performance.

***Strategic program planning must be a continuing, institutionalized process*** of problem solving and allocation of resources, not a one-shot exercise. The uncertainty inherent in technology development for rapidly changing food systems requires a planning process that is able to adjust priorities and activities in response to new opportunities or changed conditions.

**Strategic Agricultural Research Program Planning (SARPP)** can be thought of as a sequence of questions whose answers will help to define a vision, strategy and tactics that will lead to a greater payoff to investments in the research program. These include:

- What are the development goals and objectives for the agricultural sector, commodity subsector with which a research organization or program is concerned?
- What are the major constraints (with regard to technology, infrastructure, policy and institutions) to the realization of those goals and objectives; what are the relevant boundaries for analysis (regional, national, sub-national)?
- What are the opportunities for technological innovation at the farm and/or other stages in the food system? Do the technologies exist or must they be developed, and if they exist at what level (national, regional, international)?

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This paper is also forthcoming as an SD Publication Series technical paper. It can be obtained through USAID's development information system (CDIE).