

**PRODUCTION TO CONSUMPTION SYSTEM: A COMPLEMENTARY
PERSPECTIVE FOR FARMING SYSTEMS RESEARCH AND EXTENSION¹**

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INTRODUCTION

The Production to Consumption Systems Research (PCSR) approach is the application of a comprehensive system perspective to focus, organize and evaluate progress and results from research and related interventions. The target Production to Consumption System (PCS) is constituted by the groups of people, the resources and processes they command, and the interactions among themselves and with the environment that affect the production, processing, movement, trade and final utilization of a commodity. In the case of agricultural commodities, the focal PCS "intersects" with one or more farming systems at its on-farm³ production and related stages. This "intersection" highlights the interdependence of the two "system perspectives" and the potential complementarity of the PCSR approach for the FSRE approach.

This paper, that is addressed to an audience of FSRE practitioners, is intended: 1) to introduce the concepts, objectives and methods of the PCSR approach with reference to an evolving experience in East Africa, and 2) to initiate discussion on the potential and useful complementarity of the PCSR approach for FSRE as well as for strictly disciplinary research and related interventions intended to improve agricultural performance "at large" or "in the small".

THE INTENT IN THE APPROACH

The purpose is to achieve greater effectiveness and resource use efficiency in research. The expected outcome is the provision of knowledge (research results) that will actually effect decisions and actions needed to improve and sustain the social, economic and environmental performance of a commodity subsector.

Strategically, the PCSR approach focuses attention on the key human -- decision making -- components of the PCS: particularly, on their present and potential contribution to the subsector performance in order to identify and capture opportunities that will enhance such contribution. The approach uses a step-wise "incremental" path to build up the required knowledge base about the system. It also promotes the establishment of a sustainable human

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³ Or the commune as in the case of communal areas.

organization that will keep research and related interventions in the sector going and cost effective. Other individual or teams of researchers would then be able to draw freely from such a subsectoral knowledge and human base to improve on their own ability to design, obtain support for and deliver the results from their research efforts.

THE PCS NATURE AND PERFORMANCE

A clear understanding of the PCS (as defined above) will facilitate the process of making relevant research and research results based decisions to improve the performance of a target commodity sector. This is the basic premise of the PCSR approach. The system's performance is what finally matters for the system's participants and to society at large.

The system approach to such understanding requires one: 1) to define limits around the focal system; 2) to identify the important components of the system; 3) to discover the critical interactions among the components of the system; and 4) identify the critical interactions of these components with the environment outside the limits of the system. The composition and relations (in time and space) among components constitutes the **structure** of the system. The interactions (type, timing, location and intensity of exchanges) among components and of these with the system's environment constitutes the system's **behaviour** or **conduct**. Finally, the net effect of the system's structure and behaviour on its own components and on components of the environment constitute the system's **performance**.

A commodity system's performance has several dimensions. These include the social, economic and environmental effects or impacts resulting from the system dynamics. All research proposals are required to address and acknowledge both intended as well as expected effects in all such dimensions of performance. This is particularly true in commodity oriented research. Furthermore, an early definition and relentless pursuit of the improvement objectives targeted by a research intervention helps to identify the relevant elements of structure and conduct in the system that need scrutiny and action.

THE AFRICAN EXPERIENCE WITH THE PCSR APPROACH

Borrowing heavily from relevant research efforts and experiences, Egerton University (EU) of Kenya, with support from IDRC, started in 1987 to develop the concept of what is today the PCSR approach. From the start this effort was focused on the Vegetable Oil and Protein System or Subsector in Kenya (VOPS-K). Models studied include the "Method for Assessing, Programming and Managing Integrated Production/Consumption Systems" known as MEPS⁴ that was developed by the JUNAC⁵ in Latin America. MEPS was developed

⁴ From its Spanish acronym "Metodologia de Evaluacion y Programacion de Sistemas de Produccion y consumo" (Dubois, P.F., J.T. Arbulu, B. Zacharias 1984, UNIDO/JUNAC 1985, UNIDO 1986)

⁵ JUNAC is the "Junta del Acuerdo de Cartagena" the executive arm for the Andean Group, a regional grouping of countries in South America (Dubois, P.F., J.T. Arbulu, B. Zacharias. 1984)

further and used by UNIDO⁶ in Africa (UNIDO/JUNAC 1988, UNIDO 1988). Other important inputs were the reports of Michigan State University's analytical and field work on the marketing aspects of "Food Systems" in Latin America⁷ and other places.

THE VOPS-K

The need for a comprehensive subsector research approach arose in Kenya from Egerton University's interest in addressing the following issue. Until 1987 Kenya had been able to maintain relatively low consumer prices of vegetable oil in the country by relying on heavy importation (80% of requirements) of mostly palm oil. It was projected, however, that the vegetable oil foreign-exchange-import-bill, already the highest among agricultural and food imports, will quickly grow to levels that the country will find difficult to afford. This would be particularly critical during peak price periods on the highly volatile international market for the commodity. Meanwhile, Kenya has suitable agro-ecological conditions to cultivate and produce greater quantities of several types of oilcrops. Was there room for improvement of this situation?

The performance dimensions of leading importance in this concern were: the size of the vegetable oil import bill, local production levels, rural processing and consumption of high quality vegetable oils and utilization of the protein cake. The ensuing task was to identify research and related interventions that could lead to the removal of constraints to improved sector performance in those dimensions.

Initially, the EU conceptualized a four stage programme to approach such a task (VOPS-K Project 1989):

1. A preliminary review of information available on the VOPS-K, complemented by consultations with sector participants and the formulation of a more comprehensive study of the main system components and their interactions (November 1987 - April 1988).
2. A more detailed diagnostic study of the various components of the VOPS-K to identify potential entry points for technological, organizational and policy interventions that could constitute a coherent programme of research (May 1988 - December 1988).
3. Carrying out of the research programme addressed to develop the VOPS-K into an "efficient and equitable" subsector (January 1988 - December 1991).
4. Implementation of the research results recommendations (from January 1992).

Egerton University with the support of IDRC and a consultant completed stage one with a first approximation analytical model of the VOPS-K (Zulberti 1988). Figure 1 identifies the groups of people, the processes and resources they command, and the type of effects from

⁶ United Nations Industrial Development Organization

⁷ That included the concept of agricultural subsector or commodity systems as perspective for analysis (see Holtzman 1986, Harrison et al 1974).

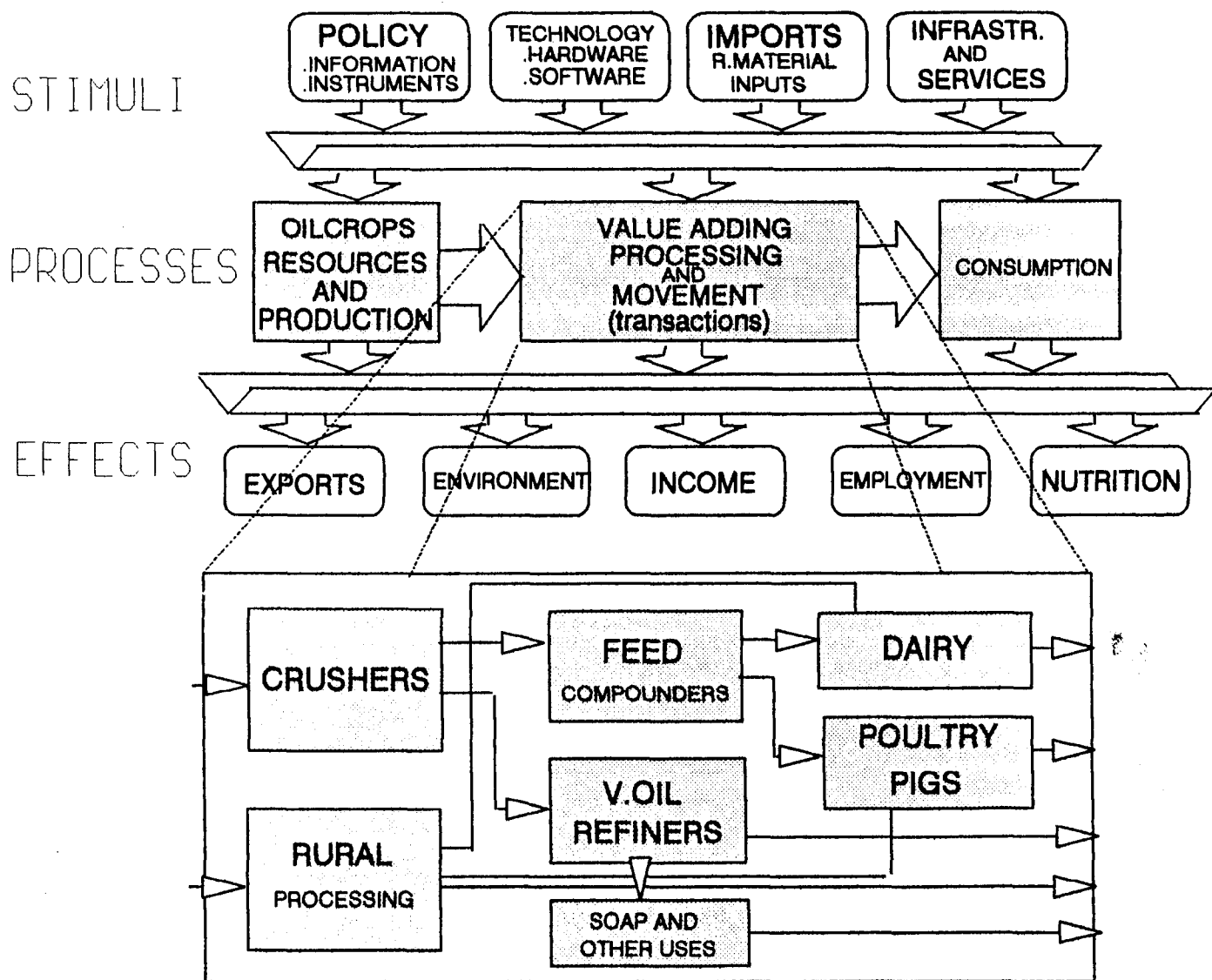


Figure 1. The groups of people, the processes and resources they command, and the type of effects from those processes that constitute the VOPS-K.

those processes that constitute the VOPS-K. Then, and as part of Stage 2, EU coordinated a series of short term diagnostic studies implemented by specific interdisciplinary teams on each of the seven main components of the VOPS-K. These "components" are: oilseeds production; fats and oils industry (processing); animal feed industry; dairy production; poultry and pig production; policy, international market and future demand environment; and farm and rural trading and processing. The reports from each of these studies identified several entries for research interventions and their priorities (Oggema, Aiyecho *et al* 1988; Odhiambo, Awiti *et al* 1988; Bartilol, Ottaro *et al* 1988; Karau and Namwamba 1988; Gichohi, Kiugu *et al* 1988; Gichohi, Mitaru *et al* 1988; Gitu, Kireru *et al* 1988; China, Mwaura *et al* 1988; Zulberti and Lugogo 1989; Zulberti, Schmidt and Navarro 1990; Zulberti 1991).

Research Programme Development and Evolution of the PCSR Approach

In trying to develop its programme, EU identified two critical elements that needed consideration. These are: 1) the need for follow through on the research results to bring about any intended or potential good effect on the system's performance, and 2) the establishment of a sustainable mechanism that keeps feeding on and orienting research by building up on previous work and investments to improve and sustain the system's performance.

This experience and its analysis has resulted in the definition of the PCSR approach concepts (Navarro and Schmidt 1991), and the perception that this is an evolution of and improvement on previous similar approaches.

The follow through to research.

This links forward to the effective utilization of research results and thus to the needed identification and hopefully participation from early in the research process of relevant agents, i.e., those who will use the research results. It also relates back to the identification during the system analysis of key component groups of the PCS and their present and potential contribution to the system's performance.

In its early attempts to develop and implement its program, EU was able to address only partly the list of priorities for research that were identified initially. For this EU utilized a three member core interdisciplinary team through which it also coordinated the work of other complementary teams financed independently.

The core team concentrated its direct research attention on the policy and information components of the VOPS-K. Other aspects of the system addressed through a series of coordinated projects financed independently were: rural processing of oilseeds, vegetable oil consumption and protein cake utilization, implemented by a separate team from Egerton University; sesame production and utilization, implemented by a team from the University of Nairobi interacting with the Kenya Agricultural Research Institute (KARI); and the VOPS-K industrial organization and conduct study, implemented by the Jomo Kenyatta University College of Agriculture and Technology. Furthermore, the VOPS-K core team coordinated the field work of several related MSc theses and small research grants.

This research coordination exercise was in itself a novel trial and administrative challenge within Kenya. One University was coordinating attention and channelling donor financial support for research projects focused on different angles of the same subsector but implemented by teams from different Universities in the country. To guide and coordinate the combined effort, the EU core team was required to keep an overall system perspective at all times.

The EU core team addressed its specific research responsibility on the policy angle of the VOPS-K by concentrating attention on the governmental policy making group and on the members of the private sector engaged mainly in processing and distribution of imported palm oil. It has been successful in consulting these groups and in bringing them together for joint discussions of mutual and total system interest. Events have included interviews, seminars and workshop discussions (VOPS-K Project 1991, and a National Policy Analysis Workshop (proceedings in print)). Soon EU realized the potential benefits from activating more of these types of dialogue for enhancing coordination and collaboration among system participants. It also discovered the need for continuous encouragement ("Championship") and information in order to keep the groups interacting while enhancing their activities and collaboration.

Thus far the team has provided concrete information and expert suggestions for the development of a cabinet paper addressing policy changes in relation to vegetable oil imports and promotion of oilseed production in the country. This policy paper is at present being revised and discussed within government. Suggestions were to deregulate consumer prices of oil and protein cake and also to establish a variable levy on imported vegetable oils. More information and probably additional research may still be required before final decisions are agreed upon. Thus far, however, consumer prices of both press cake and fats and oils have been deregulated.

The Kenyan experience has demonstrated, again, that without a coherent follow through to any research effort, the utilization of research results and the realization of their expected effects will happen only haphazardly. This follow through requires persistent attention by some person or a group. Researchers are being challenged today to be more and more concerned about this follow through process and, if possible, to also participate in it in relation to their own research efforts.

Finally, EU realized the magnitude of the work (investment) required to build up the information base about the VOPS-K that was needed to arrive at recommendations for improving the subsector's performance. Facing this was the fact that neither the country nor the PCS had a mechanism to capture that information and keep it readily available for future efforts that could build on the work already done. The absence of such a mechanism diminishes the potential returns on the present investments in research. It also enlarges the risks that future research efforts and related interventions will go through a wasteful repetition of work done. This prospect was particularly worrisome since the resources available were insufficient to tackle all the research priorities identified initially and which, ideally, should be addressed soon when additional resources are made available.

The PCS research and development guiding mechanism

The concern arising from the EU experience (VOPS-K Project 1992) suggested the need for a self-reinforcing mechanism to guide research and development in the PCS. Confirming this, the recent attempts by AGREF to expand the utilization of the lessons gained in Kenya to Tanzania and Zambia (Mbwika, Mwiraria and Chema 1992), as well as lessons from elsewhere, have also suggested the nature and composition of such a mechanism. It requires a leadership/championship component and a technical and information support component.

Leadership/championship

This is the component that maintains the overall PCS comprehensive view and understanding updated and the concern for good subsector performance in permanent focus. It also fosters the research and related interventions that are required to improve and sustain the subsector performance. This is a group of people clearly concerned and interested in the task described. Logically, its members should be interested participants of the PCS itself. The group should also include a representation from researchers who are concerned for the performance of the whole subsector or of a component of it. This group becomes the repository and main user and disseminator of the updated knowledge about the PCS. Such knowledge is used to guide and foster interventions that will improve the performance of the system further. These interventions include further research and other actions by members of the PCS or people outside.

Some countries have appointed groups, which resemble the generic group described, for the specific task of arriving at a comprehensive understanding of a subsector and to provide advice on how to intervene for improving its performance in a specified manner. One example is the team formed by the Indian government to guide its successful intervention in the oilcrops sector (Shenoi 1991, Rai 1992). Others have been formed in a more spontaneous manner by representatives of a commodity system's component groups and researchers, as in the case of the Canola Council in Canada. Voluntary "Commodity Committees" exist in Latin America. They provide guidance for interested researchers but often they act as informal advisors for policy makers on issues that involve the subsector.

No such group existed in Kenya, and information about the subsector was little and scattered at the beginning of the VOPS-K experience. Even though the VOPS-K research project included the idea of establishing a steering committee initially, this was intended mainly to guide and monitor the research progress in the project. In approaching the different system component groups and in bringing them together for consultations and dialogue, EU noticed their keen interest in participating. Finally a wide based advisory group was established by the VOPS-K project. This group includes representatives from Industry (Food/feed mills, oilseed crushers, oil import/refinery/packaging), Government (Monopolies and Prices, Ministry of Industry, Ministry of Livestock Development, Ministry of Agriculture, Ministry of Planning and National Development), Parastatals (Seed Company, KARI), private and public research, and universities. The group's discussions transcend the immediate needs of the VOPS-K research project. The expectation is that eventually this will become a permanent group that will keep the interest for continuous good performance in the VOPS-K alive, resulting in renewed actions by researchers and other systems contributors.

Progress has been faster in the experience of AGREF "cloning" part of the VOPS-K experience to Tanzania and Zambia. In the Tanzania case, available information about the VOPS-T was more abundant and accessible. The Tanzania Food and Nutrition Centre (TFNC) took on the initial leadership/championship aspects within the country. The prospects to have a solid VOPS-T interest group soon are very good. In the Zambian case, information was also already available and the interest and opportunity for the creation of a VOPS-Z interest group quickly led to the formation of the Oil Industry Liaison Service (OILS). This group is at present integrated by representatives of Government Ministries, private and public processors, non-governmental organizations, public and private research. The integrated VOPS work in Zambia and other countries has also attracted the participation of the Preferential Trade Agreement (PTA) for Eastern and Southern Africa. PTA will start in November 1992 a series of VOPS characterization and diagnostic studies in several countries of Eastern and Southern Africa.

The EU and AGREF experiences in Eastern and Southern Africa have begun to anticipate clearly some organizational and support needs for establishing and keeping active the leadership/championship group.

The Champion

In terms of organization, as in any other group, there is the need for a leading individual or subgroup. In the Kenyan experience, this individual has been referred to in a descriptive manner as "The Champion". In the case of VOPS-K, the Egerton University team, particularly its principal investigator, has acted as such a leading element. In Tanzania, AGREF identified the TFNC as such. In Zambia, leadership has been provided by the head of the oilcrops research programme within the national agricultural research system and by the Secretariat and Board of OILS.

This "Champion" is an individual or a small group permanently concerned and aware of the task in hand, with the dedication and drive to participate actively. His/her main tasks are to catalyze continuous dialogue and collaboration among subsector participants, and particularly to keep the leadership/championship group active. He/she has a "networking" and leading role within the subsector and the country.

The technical and information support

The VOPS-K experience also anticipates the need of the leadership/ championship group and its "Champion" for easy and continuous access to technical and information support. These are inputs for the group's deliberations as well as for activating and coordinating the actions suggested from those deliberations.

In the case of the EU experience the VOPS-K core team has acted as the technical support arm for and has provided information to the leading group. Also, the VOPS-K project has been building up and maintaining a comprehensive knowledge base about the subsector. It is also aware of where else in the country there is information that is complementary. This combination of technical team and information support at the EU has already been consulted

intensively by government officials, aid missions, students, academics, industry representatives and private individuals, including some farmers.

SOME OF THE REMAINING QUESTIONS

There remain many questions, particularly since these developments have been based on a still unfolding experience and through a specifically donor financed project. One basic question is about its feasibility and potential sustainability without such donor support. However, and as seen above, there are already examples of commodity focused interest groups that have been established and are guiding policy and other subsector interventions. These experiences point to some of the opportunities available to start the process. The VOPS-K type project is just one of those opportunities.

The basic objective of improving sector performance implies also enhanced benefits for at least some of the participant groups in the subsector. The perception of these potential benefits, and of the interest manifested by participants during the EU experience, make it conceivable that they could eventually finance and maintain such a leading/championship mechanism. This idea is all the more plausible if we attend to the possibility that in some cases the established subsector organization could become an effective lobbying mechanism on behalf of the subsector members.

Even though limited, the experience of the EU already anticipates the variety of scenarios to be found at the start in each country and for the different commodities. This variability that is familiar to system approach practitioners is also a source of opportunities. In some countries the starting process may be more difficult and expensive but in others easier or less costly when compared with the VOPS-K case. Particular attention should be paid in each country to existing groups and institutions that could take on the responsibilities for technical and information support to the PCS leading group with minimum additional investment. In this respect, the VOPS-K team is helping to identify gaps and distortions in information gathering by some key institutions which are intended to serve and facilitate decision making within the subsector. Additional work is needed to streamline and complement the work of these institutions and related mechanisms. The requirement, finally, is to cater for those participants of the subsector that are active seekers of information as well as for those, including farmers, who need information badly but are less aggressive or able to search for it.

POTENTIAL COMPLEMENTARITY OF THE PCSR APPROACH FOR FSRE

The intention in this paper has been to briefly present the evolution of the PCSR approach and to introduce the general concept behind it. Figure 2 shows the Production to Consumption System step-wise path to improve performance of a commodity subsector. Still, this paper has probably gone beyond what appears of direct interest for a FSRE audience. The many similarities in the research approaches and requirements for effectiveness, however, suggest that such a presentation may stimulate discussion pertinent to the FSRE approach.

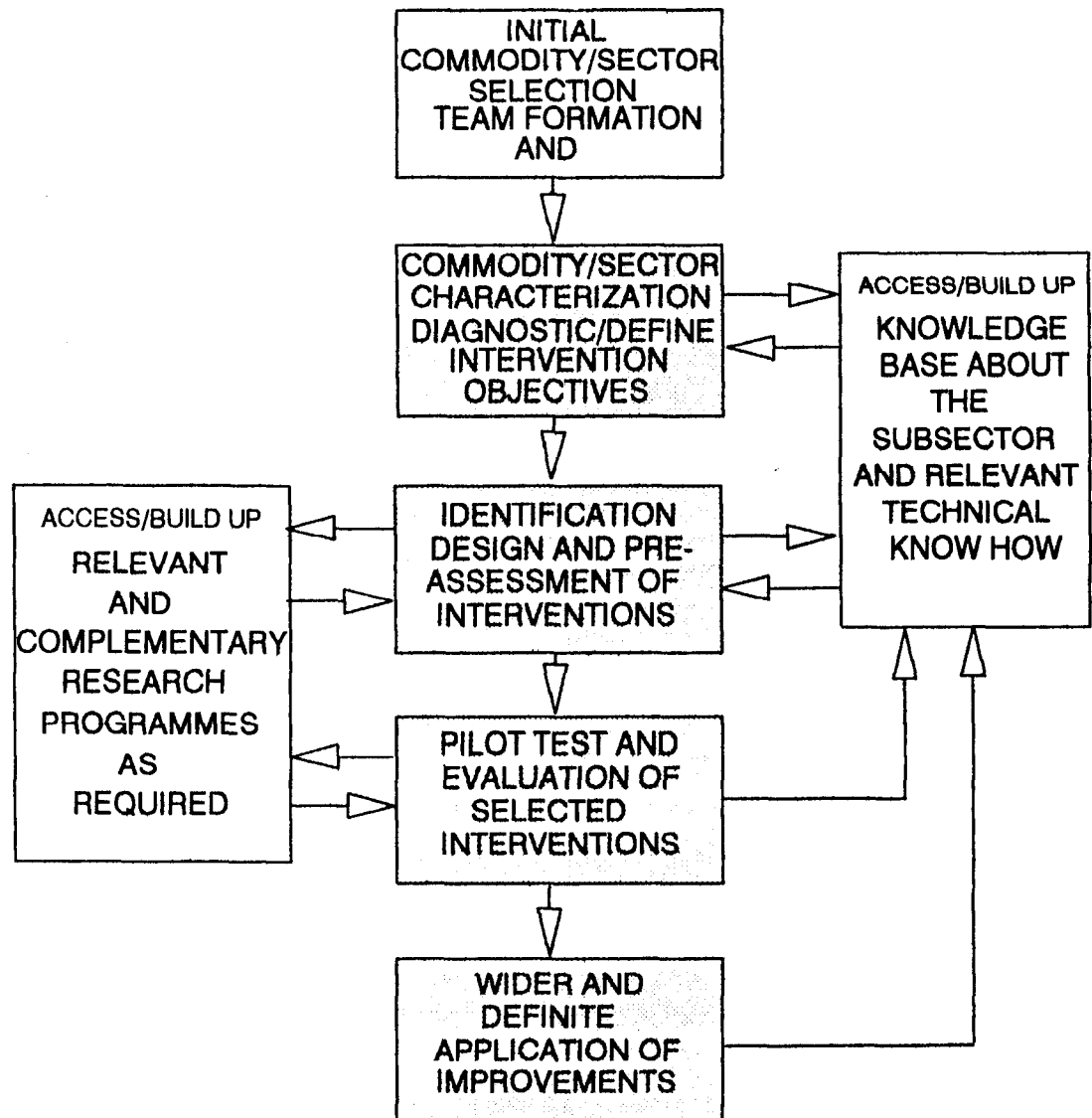


Figure 2. The Production to Consumption System step-wise path to improve performance of a commodity subsector.

The requirements and opportunities to put together and manage interdisciplinary teams are fairly similar to those of FSRE. The opportunities for employing participatory techniques of field research for diagnostic studies, evaluation and monitoring of research progress, and actual or potential application of results are also similar. Equally recurring are the questions about "the team", for example, its constitution and the characteristics of its members. Should everybody be a "system" person? Or should we combine people who feel comfortable with (and know how to maintain) a system perspective as a research guiding and monitoring tool, with other strong (and strongly discipline oriented) researchers who accept focused tasks as components of the overall task?

The Kenya PCSR experience indicates that it is illusory to think of a team that could take care of all the suggestions for intervention that result even from an incomplete diagnostic study of the system. Any attempt to persist in approaching the objectives as intended initially will therefore require a strategy to muster additional resources and to guide and monitor a longer term effort that uses all invested resources efficiently. For this, it is not necessary that everybody in "the team" masters the system perspective and has a comprehensive view of the whole system. Some researchers will work better and more productively if they are given a very focused (and probably short term) research work that will be a significant contribution to the overall task. Of course, somebody in this "overall team" (for example, the leadership/championship group discussed above) should maintain the system perspective and always keep the final objectives in view. This wider view helps to guide and evaluate the contributions of each of the participants towards those objectives.

"The team" then, could be a complex organization that changes over time and which will be difficult to maintain for the time required with governmental or donor support only. Both governments and donors prefer to support endeavours of shorter term, that activate or boost sustainable processes of direct contribution to sustainable development. In this case the expectations is that over time a PCS will become interested in maintaining its own PCS research and development structure and team from its own resources.

A VIEW INTO THE DEMAND FOR A COMMODITY IN THE FS ENVIRONMENT

There are several areas in which it can be anticipated that the PCSR approach, or the knowledge that it can generate, complements the information needed by FSRE practitioners to focus, organize and monitor progress and result from their research. This is particularly important when the PCS under consideration corresponds to the most important commodity or group of commodities that constitute the specific FS being focused on by research and extension.

A PCS permits a peek into the "environment" surrounding the FS with which it intersects and along the transect formed by the people and processes involved after the on-farm production stage. These people and processes in turn have requirements and preferences that shape their demand⁸ for the produce coming from the particular farming system. This view of the demand side is a necessary complement for the mostly supply type considerations that guide the FSRE work. This is particularly important today when even the very-limited-resource-

⁸ See also related discussion by Lynam and Janssen 1992.

farmers are concerned about selling their produce and to do it well. Farmers are usually aware of at least some of these demand requirements and try to meet them by adjusting their production decisions.

If FSRE practitioners account for the FS and farm household characteristics only, they may be missing an important determinant of the farmers' production decisions. These determinants should be internalized in the design and evaluation of improved and adoptable technologies.

A PCS diagnostic study, or the information accumulated after a time of PCSR work, could be of particular use to FSRE practitioners at their diagnostic stage. For example, to help to identify more fully the uses and user's requirements for the particular commodity that also constitutes part of the FS. This information, when combined with the knowledge about the FS itself, should facilitate the researchers decisions about: 1. what is necessary and could be done immediately; and 2. what is necessary to learn (research) in order to improve the farmer's and farm system options of meeting those demand requirements better and with improved returns.

Demand requirements include more than just quantity. There are specific quality preferences associated with colour, shape, size, texture, smell, flavour. There are requirements of timing and place for delivery that are also influenced by the existence and actions of other components of the PCS, such as competing production areas, transport and storage services and infrastructure. Information about the several dimensions of present and potential demand has become critical for most commodity research. This is true even for commodities such as cassava (Lynam and Janssen 1992) and sweet potato that are usually associated with marginal environments and farming conditions which have a production potential beyond the consumption requirements of most production farms and areas.

Information of this sort becomes a challenge for the work of FSRE teams -- in designing and developing appropriate technological options. It is also a challenge for more specialized researchers working on germplasm characteristics or husbandry practices that could affect timing of harvest among other commodity traits of importance from a demand perspective. Beyond the challenges, this information should help researchers to design research projects that are of interest to themselves and are well presented and justified. This will attract support from the potential beneficiaries and from those who can fund research. This is most crucial today when support for agricultural research is becoming highly restricted.

The PCS and PCSR information should complement and help FSRE work beyond the diagnostic and design stages. It enlarges the set of criteria and the potential set of judges and situations in which: 1. to test and evaluate the results from new technological propositions, and 2. to test and evaluate their potential final adoption and impact. Finally, such information should help to map the best strategy for extending the utilization of the promising technologies developed under the FSRE effort and the realization of the benefits expected from them.

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