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Rossmiller,G.E.; Kim,Dong-hi

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RESEARCH NEEDS FOR PLANNING AND POLICY

by

George E. Rossmiller
Dong Hi Kim

In discussing research needs for planning and policy decision-making at this point in the workshop, we should not need to spend a great deal of time in arguing the necessity *per se* for research. We should be able to start from an assumption of fact; that sound planning and policy decision-making require sound and comprehensive economic analysis. In order for a proper job of economic analysis to be accomplished, data and information must be collected and organized into a logic framework, which we might call a model, and which is conceptualized and formulated on the basis of a sound and tested theoretical foundation. If you will grant the efficacy of this logic, then we can agree *a priori* that research is a necessary and integral part of the economic analysis required in the decision-making process.

An extensive body of economic theory and a large tool

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* Paper presented at the Korean Agricultural Sector Study (KASS) Researcher Workshop, Seoul, Korea; July 30 - August 3, 1973. George E. Rossmiller is an Associate Professor of Agricultural Economics at Michigan State University, and former Field Project Director of the Korean Agricultural Sector Study Team (August 1971 - June 1973). Dr. Dong Hi Kim is Director, Agricultural Economics Research Institute, Ministry of Agriculture and Fisheries, ROK. KASS is a section within AERI.

kit of methodologies ranging from the extremely simple ruler and graph paper type to the highly sophisticated mathematical types have been developed and are at the disposal of economic analysts whose charge it is to provide the economic analysis for planning and policy decisions. An extremely wide range of means and approaches can be used in tackling the analytical job. As Professor Manetsch has pointed out earlier in this workshop, many analytical jobs are done with perspectives which are either too narrow, too short range, or both. The systems simulation techniques, which the KASS Team have been attempting to adapt to the economic analytical jobs required in agricultural sector development, have the capability and advantage of allowing the analyst a broad and long-range perspective. The system simulation approach allows for the use of many types of specialized methodologies appropriate to the various sub-issues at hand, but provides the capability of interlinking these various methodologies into a large and comprehensive logic framework representative of the total system under study, and of the environment within which that system functions.

In order for such a large systems simulation model to be conceptualized, developed, and operated, a huge amount must be collected and assimilated and tremendous numbers of parameters and coefficients must be estimated. The job is so large and has so many facets that it is impossible for a single individual, or even a very small number of individuals, to accomplish by themselves. If we take the specific example of the KASS Team approach to systems simulation modeling of the agricultural sector we can see first that a large team effort is required; and second, that the team must be composed of individuals with widely varying talents and disciplinary training. In short, the job requires specilization of tasks by individuals comprising the team.

Specilization implies that individual members of the team work on tasks to which their talents and training best suit them for developing their unique contributions to the total effort. It is extremely important to note that each individual who contributes to the team effort does not need to have a fully operational knowledge either of the contributions by all other members of the team, nor the detail of how those other team members made their contributions. That is, all team members do not have the knowledge of the systems scientist to conceptualize and develop model components; nor the knowledge of the policy economist to effectively analyze policy issues; nor the knowledge of the agronomist or soils scientist to measure the impact of the various technical determinants of crop yields; nor the knowledge of the econometrician to develop the macro-economic linkages between the agricultural sector and the rest of the economy; nor the knowledge of the farm management researcher in assimilating the economic and technical data to determine the most profitable enterprise combinations on an individual farm; nor the knowledge of the nutritionist in determining optimum levels of calorie and protein intake from the combination of foodstuffs available; nor finally the knowledge of the public administrator to develop institutional structures and processes by which plans and policies can most effectively be implemented.

Team members should, of course, understand enough about the total effort that they know how their contributions can be used and how they affect the outcomes of the comprehensiv project. Team members must have enough interaction with each other and know enough about each others activities to be able to converse intelligently and coordinate their efforts. This can develop rather rapidly if team members recognize this need, and make a conscious effort to understand and be understood; and when the members have discussed and agreed upon a set of general guidelines and objectives.

The core to an agricultural sector systems simulation modeling effort such as KASS are the systems scientists, perferably with some understanding from agricultural economics, who can conceptualize and develop the various components of the model itself; and the agricultural economists with some systems science training or familiarity which allows them to work closely with the systems scientists in model development for economic analysis purposes. In addition, a very important component of the core of such a team is the computer programmer group who convert the model conceptualizations to a language and format which allows the model to be run on the computer.

This core group needs the help of a host of other people with specialized talent. First, there are the variety of disciplines within technical agriculture which can and must contribute knowledge and data to the effort. In addition, are policy economists who can interpret output and results from the model into analysis and alternatives facing the decision-maker. In addition, the talents of sociologists, political scientists, public administrators, mutritionists, mathematicians, statisticians, and others are required. And certainly not least, the interaction with decision-makers themselves is an extremely important part of the whole process. The decision-makers must identify the problems and issues which concern them, and in turn must be able to interact in an iterative way with team members in order that the modeling effort can remain relevant and useful to them.

Several examples from the KASS Team experience may serve to vividly illustrate the point that cooperation among team members with diverse talents can produce an output which is greater than the sum of the parts taken individually. One part of the present KASS model is a population component. Early in the KASS Team activities Professor Al Beegle, a demographer, and Mr. Byeong Do Kim, an agricultural economist, produced a working paper containing their collection of demographic data on Korea's population and their projections of population over the simulation time period using a standardized computer model back at Michigan State University. Professor Dale Hathaway, an agricultural economist, took their working paper report and further extended the analysis to project agricultural labor supply available during the simulation time period by determining, under varying assumptions, the labor requirements in the nonfarm sector and under the assumption that the agricultural labor supply would be a residual. Finally, Dr. Tom Carroll, a systems scientist, came along and conceptualized a population component for the KASS model and used the work done by Al Beegle, Byeong Do Kim, and Dale Hathaway as the base input and as a means of parameterizing his model component. Each with his particular talent contributed to the final result of a population component in the KASS model.

Another example is the development of the crop yield projections found in the crop production component of the KASS model. Dr. Karl Wright and Mr. Yong Sik Kim, considering the various forces which influence crop yields and looking at historical data, made projections of crop yields for the simulation period with methodologies including the use of regression techniques and even graph paper, pencil, and ruler. Dr. Tom Manetsch conceptualized and developed the crop production component of the KASS model and parameterized a part of that component by picking up and using intact the projections made by Dr. Wright and Mr. Kim.

A final example among the many we might site concerns the fact that Mr. Forrest Gibson, a systems scientist, has been working on the conceptualization and development of a grain management program component for the KASS model. One day he met Dr. P.Y. Moon, agricultural economist at KDI, who had been doing some simultaneous equation work on grain supply-demand balances and price movements. After looking into the work by Dr. Moon in some detail, Mr. Gibson found that he could use, almost intact, as a major sub-component of his grain management program component the simultaneous equation system developed by Dr. Moon. Hopefully, these examples have illustrated the point that the KASS Team is composed of many individuals with specialized talents; and by working together toward a common set of objectives, each individuals' work contributes to and extends the work of the other team members.

As you know from past discussion at this workshop, the present operational KASS model consists of five components --- (1) an elementary input-output component tying the agricultural sector with the rest of the economy; (2) a demographic component which projects rural and urban populations, age and sex specific with rural-to-urban migration linked to historical patterns; (3) an urban demand component for nineteen agricultural commodities or commodity groups and one nonagricultural commodity based on price elasticities, time varying income elasticities, a budget constraint, and commodity consumption targets; (4) a crop production component for twelve crop categories, both annual and perennial; and (5) a rudimentary livestock component for five livestock product categories.

A careful reading of the KASS Report and/or of the KASS model User's Manual will reveal a number of areas in which additional research is required in order to improve, extend, or provide increased sophistication of the present operating KASS model. Examples of research presently being undertaken to improve existing portions of the model include the thesis research underway by two Korean Ph.D. candidates at the East-West Center, Hawaii. One is analyzing the economic and social determinants of migration and the other is determining the impact of rural-to-urban migration upon the agricultural firm and its organization. The results of these studies will hopefully be useful to Dr. Carroll in linking the migration portion of the population component through these economic and social variables to other components of the model, thus making migration rates endogenous. In addition, much of the work being done by Dr. Lloyd Teigen and Mr. H.H. Suh will not result in a new model component, but will rather be integrated into existing components for improved handling by the model of the international trade aspects in both agricultural inputs and agricultural commodity markets.

Further, a number of new components are being developed to increase the capabilities of the KASS model. A farm resource allocation component in the form of a recursive linear program has been developed by Dr. Hartwig de Haen and is in the process of being installed as part of the KASS model. This component, along with the annual price adjustment component, makes endogenous to the model both the allocation of resources including land between crops and the price of those commodities where price is determined by the market mechanism. Mr. Jeung Han Lee is working on a component wherein he is modeling the determinants of yield changes in agricultural crops, and which will make yield determination endogenous to the model. Dr. Lloyd Teigen, Mr. Han Hyeck Suh, and Mr. Seong Rhee are both working on disaggregations of the nonagricultural economy side of the input-output component linking the two sectors in order that more detailed interaction between agriculture and the rest of the economy can be model determined. Forrest Gibson is working on a very detailed grain management program component which includes both a private grain marketing subsector and a government grain management program which will be capable of assessing a variety of government policies dealing with pricing, storage, transportation, and import of grains. Mr. Seong Wu Lee is working on a rural demand component to parallel the existing urban demand component. Finally, Dr. Manetsch, Dr. Carroll, and Mr. Dong Min Kim are developing a livestock production program component which will be much more detailed and will likely replace the very rudimentary livestock production component now present in the model.

But through our development and use of the model, many more specific research needs have come to light. In at least two ways the model can help determine research and data collection needs and priorities. First, as the model is conceptualized and the interconnecting linkages of the system formalized the kinds of data needs and parameter and coefficient estimates needed become apparent. Second, by running the model in sensitivity analysis mode, we can determine the extent to which a predetermined change in a model parameter affects each of the wide array of consequences in which we are interested.

Thus we can know the degree of accuracy required of the data and coefficient estimates in order to have reliabl and accurate readings of the consequences output. The values of the consequences will be much more sensitive to some of the input data and coefficients than to others. Priorities can then be established on where to allocate scarce resources in improving the accuracy of the data. Further, this information can be valuable in allocation of scarce resources to programs and projects to improve the state of reality which the input data measures. It follows then that this kind of research can be a powerful tool, not only in analyzing problems and issues with which decision-makers are already concerned, but also in revealing problems and issues with which decision-makers <u>should</u> be concerned.

For example, in thinking through the steps in the process of rice production, processing, transport, storage, and marketing through both wholesale and retail, to the ultimate urban consumer, literally hundreds of factors must be considered. One of those factors is the loss as the rice is harvested and moves through the total process to the consumer. Losses occur from shatter in the field, spoilage in storage, leakage in transport, and to rodents and insects throughout the process, as well as in other ways. While putting together the KASS model we could find no definitive research data on either the total loss to all causes or losses due to specific causes. The only sketchy evidence we found was a 1968 USAID/K study by a Kansas State University team on grain losses in Korea. Thus the production and marketing loss coefficients in the KASS model are based on the most tenuous of information. A sensitivity run with the model changing these loss coefficients indicates that foreign exchange requirements for rice imports, agricultural income, and other consequences are quite sensitive to the estimated value of the loss coefficient. Therefore, we might conclude that accurate data on losses is important; and further, that the benefits from decreasing the losses may warrant the allocation of substantial resources to policy and program development designed to reduce loss levels.

The above example illustrates only one of many areas where improved data and additional research is required both to improve the KASS model and as general information in its own right, of use to planners, policy decision-makers, and other researchers. Other areas of research are indicated to the researcher by a careful reading of the KASS Report and the User's Manual for the KASS model as well as through the extremely important process of interacting with decision-makers. In the final analysis, the quality of planning and policy decision-making for agricultural sector development can be only as good and as comprehensive as the research back-up to the economic analysis portion of the decision-making process.