

PRIVATE SECTOR VIEWS
ON THE
RESEARCH AND DEVELOPMENT NEEDS
AND
PRIORITIES OF THE CANADIAN FOOD SYSTEM

"A report to the Ministry of State for Science and Technology on the results of eight workshops held during May and June 1977 with private sector representatives from various stages of the food system on current activities, priorities and future directions of research and development within the Canadian food system".

SUBMITTED BY

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VICE-PRESIDENT

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October 3, 1977

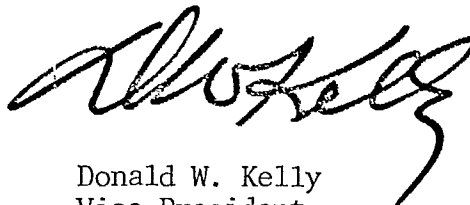
Miss K.K. Campbell
Policy Advisor
Ministry of State for Science
& Technology
270 Albert Street
Ottawa, Ontario
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Dear Miss Campbell:

I am pleased to submit 3 copies of our report on the results of the eight workshops held during May and June 1977 relating to the research and development activities and priorities of the private food sector in Canada.

This report is in fulfillment of our agreement with the Ministry of State for Science and Technology dated April 4, 1977. However, I would be pleased to be available to you and the Interdepartmental Task Force on Food Research for discussion of the report and any issues arising from it.

Yours very truly,



Donald W. Kelly
Vice President

Encl.

ACKNOWLEDGEMENTS

Without the interest and spirited participation of the 43 men and women from a wide range of business and academic backgrounds who attended the workshops, this study could not have been completed. They attended the workshops on their own time and expense and subsequently many submitted supporting material to their workshop comments and provided valuable critiques of the draft notes of the meetings.

Each attendee is identified in Appendix I of this report but here I wish to express my considerable appreciation to them collectively for their efforts.

Miss Kathleen Campbell and Miss Jane Teeter, both from MOSST were of enormous help to me in the preparation and conduct of the workshops. Without their valuable assistance my task as moderator would have been considerably more difficult and much less enjoyable. My heartfelt thanks to both of them.

While I have tried to accurately reflect the main views and ideas of the workshop attendees, there was such a rich and diverse presentation of material that I am certain some has, unintentionally, been omitted or underemphasized in this report. For such errors and omissions I assume full responsibility.

Finally I wish to express my appreciation to the Interdepartmental Task Force on Food Research, and in particular its Chairman, Dr. Peter Meyboom for the opportunity to participate in its study of the issues relating to food research and development in Canada. These issues are critical to the accomplishment of the basic principle, set out in "A Food Strategy for Canada", which was "... to ensure adequate supplies of safe and nutritious food at prices which are reasonable both to producers and consumers." It is hoped that this study will make a contribution to the achievement of that principle.

DWK
Ottawa
October 3, 1977

I CONTEXT OF THE STUDY

The study reported herein represents only one of several inputs into the deliberations of the Interdepartmental Task Force on Food Research whose terms of reference are:

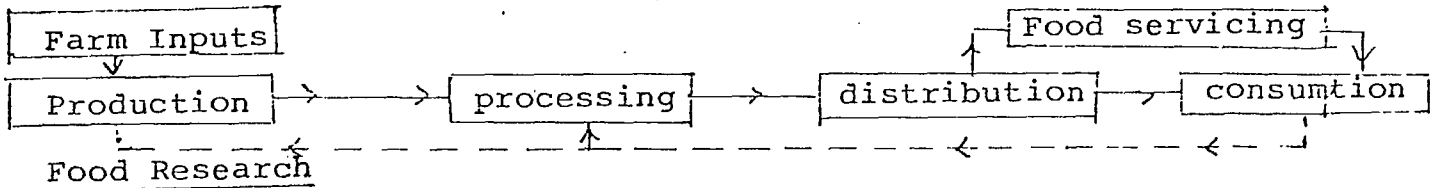
- (1) to identify Canada's long-term research needs with respect to food;
- (2) to propose priorities for food research, consistent with the government's food policy objectives; and
- (3) to suggest appropriate government measures to ensure that the needed research both in the public and private sectors be accomplished.

Specifically, the purpose of this study was to seek the views of representatives from the private sector on Canada's current activities in food research, the priorities and needs guiding such research, and the probable directions in which food research will move in the future.

To obtain these views a series of eight small, relatively informal and unstructured meetings were held in Vancouver, Saskatoon, Toronto and Ottawa attended by individuals identified by members of the Task Force who represented farm inputs, production, processing, distribution, marketing and consumer interests. The meetings were moderated by the author, an independent consultant from the private sector, in order to give a degree of impartiality and freedom to the discussions. A list of the attendees to each workshop is shown in Appendix I.

In selecting the attendees and organizing the individual meetings the concept of a "food system" was employed. The food system is perceived as having 6 stages or levels (see Exhibit I). Each stage is perceived to have its own research and development priorities and requirements, some of which interact with, or are dependant upon those of other stages of the food system.

EXHIBIT I: THE FOOD SYSTEM



For example, the study disclosed that at the production stage considerable "R&D" emphasis was being directed towards the development of new and hardier forage crops and vegetable crops. The successful outcomes of these activities however, were dependent upon the development of new harvesting techniques and equipment - requiring "R&D" work at the farm inputs stage - and improved processing, storage and distribution - requiring "R&D" work at the processing and distribution stages.

Thus while attendees were invited to a meeting, the orientation of which was primarily towards one of the six stages of the food system, there was considerable overlapping of interests and discussion from one meeting to the next.

It also should be noted that in addition to covering the food system stages of farm inputs, production, processing, distribution and marketing and consumer/nutrition, a final meeting was held, attended by persons primarily concerned with the totality of the food system. At this meeting there were federal government attendees; and issues relating to government policies and the management of the total system were discussed as well as food research and development matters.

In order to provide some continuity and comparativeness to the workshops each was asked to respond to five major topics:

- (1) the current "R&D" activities (both public and private sector) and priorities within the particular stage of the food system being considered;
- (2) the adequacy of that activity in meeting the needs of the private sector, and the constraints, if any, on expanding such activities;
- (3) the nature and degree of co-ordination of "R&D" activities which existed between organizations (both public and private) within each stage of the food system, and between adjacent stages;
- (4) the strategic objectives and resource requirements for "R&D" activities for the next 5 to 10 years within each stage;

- (5) the perceptions, and aspirations of the attendees regarding the role of the federal government in food research and development.

As might be expected the discussions at each workshop did not follow neatly a progression from topic 1 to topic 5, nor were they confined solely to these identified issues. Nevertheless it was possible to organize the notes and recollections of each meeting under the 5 major topic headings presented above (allowing some considerable latitude) and this is the format adopted for reporting the results of this study.

II CURRENT RESEARCH ACTIVITIES AND PRIORITIES

GENERAL:

At the beginning of each workshop session the following questions were asked:

"What is the orientation and emphasis of research and development within your organization and at your stage of the food system? Why and how have these particular research priorities been chosen?"

The dominant orientation at all stages of the food system for the private sector representatives was clearly one of cost reduction, productivity improvement and projects of a short term nature which would improve the basic economics and profitability of organization. To some considerable degree such activities were not even perceived as "R&D" in the scientific sense, but rather the normal management activities necessary to keep costs and profits in some balance.

In identifying the issues to which their "R&D" activities were being directed a number of attendees (particularly from the processing and distribution stages) also cited increased government intervention and regulations in such areas as health and safety standards, packaging and labelling requirements, environmental pollution, as significant factors in determining research and development priorities and activities. As one attendee stated:

"We are having to spend increasing amounts of "R&D" funds for defensive activities - that is to justify current operating conditions and respond to new government regulations and controls".

Except for some instances at the production stage there appears to be very little current activity and few resources in the private sector being directed towards basic food research or long term new food products development projects.

In the academic and private research institutions current and long term priorities and programs are very diverse and generally unco-ordinated between research institutions and within the various food research disciplines. There is some academic research work being done on human nutrition, some on food technology, some on toxicology, animal nutrition, aquaculture and food engineering but in very few academic institutions, did there appear to be any concerted attempt towards a multi-disciplinary approach in food research.¹ This situation, and the constraints which it places on food research and development in Canada will be discussed more fully in a subsequent section of the report.

While not asked specifically to comment on the federal government's food research priorities and activities, attendees at several of the workshops expressed concern about the lack of relevance and esoteric nature of much of the current research being done by the government. While it was accepted that it was with governments (both federal and provincial) that most of the "basic" food research was being conducted, such research was seen as being too much of an "ivory tower" approach to Canada's food research problems.

¹The Nutritional Research Centre at the University of Laval is a notable exception.

FARM INPUTS:

Representatives from farm equipment, feed manufacturers, fertilizers, agricultural chemicals and seed attended the farm inputs workshop.

In the fertilizer and chemicals sectors current "R&D" activities are heavily focused on developing alternative raw materials sources to lower production costs, and upgrading the efficiencies of fertilizers and chemicals used in food production. In seed production there is a current (and continuing) priority on the development of new varieties and improving the yields of established varieties. Incidentally, the promotion of breeders' rights legislation, while not an "R&D" activity, is commanding considerable attention and resources of this sector at the present time, and is held to be an important factor in encouraging "R&D" in the seed sector.

In the farm equipment sector "R&D" activities are essentially directed toward cost reduction and the development of competitive product features. While there is some interest and activity in this sector relating to energy conservation matters, (through better engineering and design and further application of diesel power) this area was not seen as a major priority at this time.

PRODUCTION:

Representatives concerned with grains production and distribution, animal husbandry and health, agricultural engineering, plant sciences, horticulture, poultry, aquaculture and resource management (including human resources) attended two workshops relating to the production stage of the food system.

Current research priorities in the production stage of the food system appear to be closely related to the maturity of the industry involved. For example, the poultry industry has had its "great leap forward" as far as basic research in productivity is concerned and it is now almost totally concerned with "applied" research matters such as production efficiency and market development. The aquaculture industry, on the other hand, has high priorities in basic research as well as in areas such as product development, productivity and process technology. Horticulture is considered still to be an underdeveloped and innovative sector of the food industry in Canada and research emphasis appears to be mainly on basic productivity problems and adaptation of crops to Canadian climate. Considerable emphasis is also being placed on research relating to the storage, packaging and distribution of horticultural crops, although greater research resources and attention is felt to be needed in these areas.

Therefore, it would seem that in the more mature sectors of food production, research priorities are on the reduction of current input costs and the expansion of markets. In newer sectors the priorities are more on basic research product development and innovative production procedures.

Academic-based research relating to food production is being guided by two factors:

- (i) the orientation and research interests of the individual researcher; and

- (ii) the priorities and needs of the funding agency. The latter often outweighs the former.

Some research work is being done in the university setting relating to the utilization of waste materials such as straw and the recycling of animal wastes but this is not a widespread priority of academic research.

While there is considerable diversity of research interests and projects within the production stage of the food system most of this activity is concerned with immediate or short term issues. It was found that, with the exception of horticulture and aquaculture, little research attention or resources are being directed to meeting Canada's long term domestic or export food requirements.

PROCESSING:

The two processing workshops included representatives from meat packing, oil seed processing, bakery products, canning, brewing, food additives and spices as well as academics and private research organizations concerned with food processing issues.

Current research and development priorities for food processors are almost exclusively related to short term applied research activities, such as input cost reduction, improved productivity, and current market and consumer requirements. Product safety and pollution abatement (both arising from increasing government food standards and regulation) were two other areas frequently cited as current research priorities.

In only one instance did a processor have a research group concerned with longer term problems of Canadian food requirements. It was generally agreed that this kind of research orientation is rare in Canada.

There is little interest or activity at the processing stage in "basic" food research even in such areas as protein synthesis, new food substitutes, long life food preservation or food enrichment. Generally processors believed that:

- (i) they could not afford the required investment for such research at present cost/profit conditions within their sector;
and
- (ii) they could easily avail themselves of much of the benefits which might arise from such research at relatively low cost-from government sources or by special arrangements with parent organizations, suppliers and other non-competitive firms in or outside Canada.

Thus for food processors, current "R&D" activities are heavily oriented to short-term economic and marketing considerations. In this context, much of the research being done by government agencies (i.e. agricultural stations and laboratories) and by academic institutions was perceived as being of little value to the processors. The P.O.S. Pilot Plant Corporation, associated with the University of Saskatchewan

was cited as a potential "model" for expanding the scope of research activities at the processing stage in the future, in that it provides pilot plant facilities on an "as needed" basis, and allows a processor to carry out development research on a totally proprietary basis.

However, P.O.S. is still a new organization of limited scope, and it is still too soon to make any substantial assessment of this new innovation in food processing research.

Academic research relating to the processing stage is relatively limited, and currently has little impact on, or relevance to "R&D" priorities at the processing stage. Some academic food research groups are trying to establish closer relationships with food processors, but currently funding from this source is limited. Instances were also cited where the research objectives and publishing requirements of the academics wishing to do processing research were incompatible with those of the potential sponsor. This is felt to be a fairly common problem in academic-private sector research relationships.

DISTRIBUTION/RETAILING/CONSUMER INTERESTS:

Two workshops were held relating to the distribution, food servicing and consumption stages of the food system. These meetings were attended by representatives from major food chains, the dairy industry, multi-food products manufacturing, general merchandising, and academic research centres primarily concerned with food nutrition and consumer studies.

At these stages of the food system the research priorities are clearly directed towards economic and social concerns relating to food, rather than technological concerns. It is at this end of the food system where the issues of food pricing, food nutrition, consumer dietary habits and the management of the total food system appear to have their greatest impact. In the research related to such matters, there is considerable integration of activities between Canadian retailers, suppliers and between Canadian and U.S.A. research groups. However, there appears to be very little co-ordination or co-operation of research efforts between the operators at these stages of the food system and the government agencies which are attempting to develop food policy in Canada.

Improvement of basic food quality and nutrition is not a current priority within the food distribution/retailing sector. As one attendee observed:

"Consumers buy on price not nutrition. Maintaining competitive prices and watching those very narrow margins is where the research (if you can call it that) is."

Retailers and distributors find they must also look to the future market and the impact of the changing nature of family households. As more and more food is being consumed outside the home, the basic structure of food retailing is being examined, particularly with reference to the impact of "fast food" outlets, and increased demand for prepared foods. The economic, legal and social implications of increased vertical integration in the food industry, and new marketing structures are of high research interest. Different or more convenient packaging is also

of continuing research interest, although most of the basic research in this area is done in the U.S. and the results are then studied for their applicability in Canada.

Attendees from the dairy industry noted that because 80% of the industry is U.S. owned, research and product development is done mainly in the United States and is primarily directed towards maintaining market competitiveness rather than basic product change. Since dairy products are considered to be intrinsically nutritious, and there is already considerable government control over product quality and characteristics, relatively little research is currently underway relating to upgrading product qualities or extending the shelf life of products. Considerable "R&D" resources are directed to the packaging of dairy products, and new product introductions (e.g. yogurt, new cheese flavours).

Academic research priorities at this stage are focused on the nutritional aspects of food, and on consumer dietary behaviour. There was general concern however, expressed by both the academics, and the private sector representatives that far too little resources - both human and financial - were available in Canada for nutritional and consumer research. Further, when funding was provided by governments, the projects selected for study often appeared to be related to short term "crisis" issues, such as milk powder surpluses, rather than to more fundamental social and economic issues of the food system in Canada. It was also noted that multi-disciplinary research was needed in addressing the important research issues at this stage of the food system - but this was the type of research for which it was the most difficult to obtain funding - either from government or from within the academic institutions themselves.

III ADEQUACY AND CONSTRAINTS RELATED TO FOOD
RESEARCH AND DEVELOPMENT

After the discussion of current research and development activities attendees were asked to express their views concerning the adequacy of, and constraints upon the current levels of food research at their respective stages of the food system.

The questions put to the attendees were:

"Is the current level of basic and applied research, in both the natural and human sciences, adequate or appropriate at your stage of the food system? What do you perceive as the major constraints upon improving the adequacy of research and development at your stage?"

While recognizing that "adequacy" is a very subjective term it was possible to obtain a fairly consistent viewpoint from attendees as to the appropriateness of the current balance of research effort and resources being spent on basic and applied research,¹ and on the adequacy of human resources and personnel training and development programs to meet current Canadian needs.

As might be anticipated, attendees were much more willing and able to express their views on the constraints to food research and development than on the more general question of adequacy. However by combining the discussion of adequacy and constraints it was possible to elaborate on the former from comments about the latter.

¹See Appendix 2 "Definitions" for the distinctions which were drawn between "basic" and "applied" research.

GENERAL:

A viewpoint expressed in most of the workshops was that the issue of adequacy was not one of too few dollars or research facilities and personnel in total, but rather that there was a serious imbalance in resources being allocated between basic and applied research.

Most attendees, and particularly those at the production stage workshops, acknowledged that the "basic" research which had to be done would, and should, be undertaken by the large research institutions such as governments and universities, which had the funds, laboratory facilities and project time horizons to accommodate this type of research. However, there was a consensus, even among the university representatives, that too large a proportion of Canada's food research efforts were being directed into "basic" research projects which had very uncertain outcomes and little relevance either to the needs of the private sector. Further, it was felt that for the basic research which was required, inadequate resources were being devoted to such areas as:

- (i) . . . grains and forage crops other than cereal and feed grains;
- (ii) agricultural development opportunities particularly suited to Canadian climate conditions; and
- (iii) food toxicology and the impact of processing on nutrition.

Concern was also expressed about the amount of financial and human resources which apparently are being spent on the administration of

government food research programs (whether basic or applied) relative to the actual research work being performed and the importance of the project.

Concerning the adequacy of applied research, an inconsistency appeared to exist between the private sector's perceived need for additional resources for applied research and their unwillingness to devote more of their own resources to this end. There was general agreement that governments in Canada should be investing a much larger proportion (60% to 70% was suggested) of its total research expenditures in "applied" areas such as horticultural crop development, new product innovations, better distribution and storage systems, market development, labour productivity and consumer studies, but the private sector appeared reluctant to reciprocate because of current economic conditions, the costs involved, or the availability of related information from parent organizations or industry sources.

Some private sector attendees did state that if the government provided more substantial financial incentives in the form of tax incentives to conduct research and development, more would be done in Canada. However, financial incentives such as grants or contract work which require the company doing the research to release its findings into the public domain were of little interest because little or no competitive advantage could be realized from such research.

There was general agreement and concern, among the academic attendees that:

- (a) there was a lack of funds available to them for either basic or applied food research in Canada; and

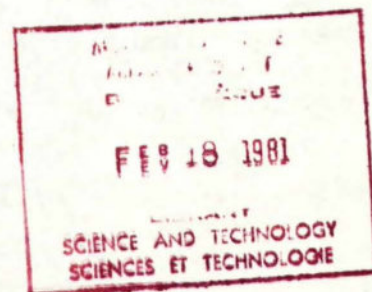
- (b) the present system of granting funds seriously inhibited food research in Canada.

These two issues were seen to be very much interrelated.

Three main factors influence the food research undertaken by academic institutions:

1. the interests and orientation of the researcher;
2. the availability of human resources (mainly graduate students) and physical facilities to the researcher;
3. the research priorities and administrative requirements of the funding agency.

The second, and particularly the third factors were seen to dominate the whole academic food research activity. Academic researchers expressed a desire to engage in more applied research in the field, and to place greater emphasis on the engineering, economic, nutritional and sociological aspects of food research. However, the predominant source of funds to them was from the federal and provincial agricultural departments whose orientation was much stronger towards basic research in the natural sciences. Thus academic researchers find that frequently they must "warp" their own research priorities and interests to meet those of the funding agency.



The administrative "red tape" and the limited funding periods were also cited as inhibiting factors in conducting research. Several attendees cited research projects which required a time frame of several years before substantial results could be obtained. However, funding was granted on an annual basis and required excessive administrative work to ensure continuity to the projects.

The problem of obtaining funding for multi-disciplinary research was also seen as a serious limiting factor to conducting research. Attendees cited several instances where they were unable to obtain government funding for research to be conducted by teams of researchers (rather than one individual). This type of constraint was felt to be particularly unnecessary and undesirable.

FARM INPUTS:

The current level of basic research at this stage of the food system was seen as being adequate. The point was made that the real need was to apply the research which was already available within Canada and from other countries. As one attendee put the issue:

"We don't need to re-invent the wheel, we need to learn how to use it".

Expanding on this thought, attendees felt that greater attention and resources were required in the human sciences of food research, (i.e. economics, management, market evaluations). It was noted that

basic research, wherever it was done, was of little value to Canada unless accompanied by product development and market studies which could capitalize on the basic research and support market development. It was noted that excluding cereal grains, Canada is a net importer of foods, and more applied research was needed on horticultural crops and other food stuffs which are, or could be indigenous, to Canada.

It was also noted that because of the system of funding and administrative problems related to research in Canada, and the lack of financial incentives for the private sector, multinational corporations have very little interest in conducting food research in Canada.

PRODUCTION:

This stage of the food system is almost totally dependent upon government and academic sources for its basic research. The private sector of the production stage has little interest in conducting or funding basic research because of the long term horizons and uncertain outcomes involved, and because of the difficulty in maintaining a proprietary interest in the results of such research. While the current level of total expenditures was considered adequate, it was felt that a much larger proportion of government expenditures should be directed to research projects related specifically to Canadian food problems, such as the development and storage of cold climate crops. In general there was a need to allocate more of Canada's food research resources to determining and developing specialized areas of expertise ¹ (perhaps in aquaculture) which would not only serve Canada's domestic food needs

¹Poultry breeding and potato processing were two examples cited of specialized Canadian expertise.

but also reduce the countries dependency on cereal and feed grains for food exports.

An improved system of support and incentives for academic and private sector research was seen as needed to encourage more emphasis on applied research and new product innovations.

PROCESSING:

Very little food research and development is being conducted in Canada at the processing stage of the food system compared to other stages of the food system. Research incentives are insufficient or inappropriate to encourage the private sector to engage in processing research. There is little funding by the private sector of academic research at the processing level, and academics must modify their applied research interests to meet the interests of government funding agencies which are much more basic research oriented.

Private sector food processors recognize the potential problem of dependency on foreign research activity, but expressed a low level of concern. The belief that "processing research can always be bought or obtained somewhere" limits any commitment to such research in Canada.

It was felt that there is a danger that Canada may try to "spread itself too thin" in terms of process research. There is a need to specialize in certain specific areas. Therefore, Canada's dependence on other countries for research information was not looked upon by some as being necessarily bad. Attendees noted that often companies could buy research cheaper than doing it in Canada. For example, the Food Research

Institute in Sweden was noted as being a particularly good source of research assistance for Canadian processors.

In view of the small size of many companies and markets, Canadian processors see their role as adapting the research which has already been done by others.

One limiting factor of this approach however, is that it provides no opportunity for Canadian processors to influence basic research into areas of most interest and value to this country. Thus, full advantage cannot be taken of some of the food research which has been undertaken by other countries and at the same time, all of its domestic research needs are not being met.

DISTRIBUTION/RETAILING/CONSUMER INTERESTS:

For the distribution and retailing sectors "food research" deals very little with food products per se, and much more with the economics, physical distribution, merchandising, labour productivity and working conditions of the food industry and with consumer food lifestyles. Virtually all of this "research" is being done privately by the companies involved, often in close co-operation with suppliers and other non-competitive food merchandising units in other countries (particularly the U.S.A.). Since much of the research is of a proprietary nature, it was felt that little opportunity existed or would be welcomed for further government participation. The only major area in which the current level of government research was felt to be inadequate was in basic economic and statistical studies of food market in Canada.

The nutritionists attending the workshops felt that inadequate resources and attention were being directed to basic food nutrition research and to the study of Canadian eating habits. These attendees also cited many of the problems in obtaining the necessary funding for such research already noted previously. Particularly in the consumer research area, multi-disciplinary projects were needed and, as noted before, it is difficult to obtain funding for these types of projects. It was also felt that contract work received from government agencies was often directed towards seeking solutions to short-term problems and in response to political pressures (eg. the powdered milk surplus). This tended to distract the universities from research in Canada's more basic longer term food problems and from developing well trained food research personnel.

Representatives from the dairy industry expressed a desire to see more applied research done in Canada but noted that with a high level of foreign ownership within its industry, most research of both a basic and applied nature was done outside Canada, and easily adapted to this countries needs. It was felt, however, that increased government support of economic studies, particularly regarding food distribution problems in Canada was needed and warranted.

Attendees at this stage of the food system also felt that much of the government's "research" activity appeared to be directed towards "pinning the blame on someone (other than the government) for rising food prices". It was felt that such an orientation had proven to be inconclusive and counter-productive in dealing with Canada's food policy requirements. It also diverted research funds which might be used by the private sector from improving the distribution system to producing counter arguments and "reactive research".

IV THE CRITICAL PROBLEMS OF CO-ORDINATION AND COMMUNICATION

GENERAL:

At each workshop, including the last one dealing with the total food system, the most frequent issue raised was the lack of co-ordination and communication of objectives and activities for food research which exists in Canada.

When asked the questions:

"Is co-ordination and communication of food research activities adequate within and between food stages?
Is there a satisfactory integration of research results into actual operations within the food system?

the almost universal answer to both questions was 'no'.

The need for improved co-ordination and communications was seen to exist on at least five levels:

1. between government and other (mainly academic) research centres;
2. between government and organizations within each stage of the food system;
3. between academic research centres and organizations within each stage of the food system;
4. between organizations within the same stage of the food system;

5. between stages of the food systems.

On a more conceptual level there was a sixth level - between basic and applied researcher - (generally referred to as the problem of technological transfer) which was felt to be very inadequate.

Problems relating to the first level have already been discussed in this report and include the lack of agreement on research priorities between government and university researchers, research administration problems, availability of funds and differences in research time horizons.

Except at the production stage where basic research activities are considered to be fairly well co-ordinated between government and the private sector, all other stages expressed a serious lack of:

- (i) understanding of government research priorities;
- (ii) mechanisms (that worked) for technological transfer;
- (iii) feedback on proposals for food research objectives and priorities.

There was particular concern expressed that "governments were not listening" to research proposals emanating from such groups as the Canadian Grains Council, the Canadian Agricultural Research Council and other industry-based organizations concerned with food research. The feeling was that a great deal of time and effort, and many meetings with government officials was devoted to generating research recommendations which "go up the line but never seem to come back down".

Private sector organizations at several stages of the food system also strongly expressed a need for some data system which would identify current food research projects and activities throughout Canada. It was apparent that, except at the production stages there was little awareness of the systems which now exist for identifying research activity in Canada such as the CARC and NRC research inventories. The fact that these were not well known to the private sector only serves to emphasize the need for better communication of research activity throughout the entire food system.

Communications and co-ordination of research activities between academic research units and business organizations within each stage was thought to be somewhat better than with government but the problems of incompatible research priorities and time horizons between academics and businessmen did occur. In addition, because most research done by academics for the private sector was on a proprietary basis, little of such research is broadly disseminated within the food industry so that it can have widespread benefits. The desire, and need, for academics to publish the results of their research also inhibits the degree of co-ordination of research activity between the academic and private sector which might otherwise exist.

Co-ordination and communication of research objectives and activities among business organizations within the same stage of the food system was more extensive than might be expected. Particularly at the distribution and retailing stages there appears to be considerable exchange of technological, economic and social information of an industry nature between suppliers and customers and on an international level.

Between the various stages of the food system there appears to be little co-ordination or integration of research efforts. Even with adjacent stages, such as farm inputs and production, examples were cited where development of new ground crops was inhibited by lack of proper harvesting equipment. In particular attendees stated that there were no effective mechanisms or structures within which private sector organizations at various levels of the food system could discuss and develop appropriate research strategies for the whole food system or respond to government initiatives in this area.

FARM INPUTS:

Attendees stated that there was very little co-ordination or integration of research being done in Canada. While there were some mechanisms for co-ordination such as CASCC, these were not proving to be effective. Information was not filtering through the system, "recommendations regarding research priorities seem to go up, but nothing comes down". Even among the private sector firms within the farm inputs stage there is little attempt to co-ordinate opinions or proposals to government on food research matters. A current government initiative which allows private sector researchers to utilize the resources of the government's research stations was cited favourably as one method for achieving better food research co-ordination and harmony of interests.

It was further suggested that with the increasing involvement of provincial governments in food policy issues, federal-provincial relations have become a very important dimension of research and co-ordination in this area is lacking.

PRODUCTION:

Basic research at this stage is co-ordinated by meetings of approximately twenty industry and government officials from across Canada who look at food production from a systems approach. The decisions arising from these meetings are included in the CASC and CARC research inventories but attendees felt that nothing further appears to result from the input and advice of industry. While industry representatives recognized that their views and proposals may not always fit the objectives and priorities of the government decision-makers it appeared that senior government officers who have final authority or power may overrule suggestions made by lower officials who are in closer contact with industry.

It was suggested that identification of national goals followed by identification of regional and sub-regional goals was required. There should be considerably more involvement allowed at the regional level in the establishment of such goals. Research money should be allocated to officials within each level of the hierarchy to allow them to move together in a co-operative effort towards national requirements.

It was further suggested there was a need for a comprehensive data bank on current and past research. Some duplication of research at the production stage was not viewed as a major problem since repetition of research results was often necessary and desirable. However, in general, there seems to be inadequate access to the fund of information on past research.

PROCESSING:

The problems of obtaining competitive advantage and maintaining proprietary control of the results of research are seen as the major factors inhibiting communication and co-ordination at this stage. While attendees acknowledged that there was some need to prioritize research activities, for example in new technologies for food processing and upgrading nutritional values, the mechanisms for achieving this were difficult to develop.

Academics doing research at the processing stage were under similar proprietary and competitive constraints and had limited interest in (applied) research projects which would contribute relatively little to their academic advancement. To correct this situation the current criteria for promotion in academic research groups have to be modified, such as the limitations on publications of research results which are imposed by the funding sources.

While in certain sectors of the processing stage (such as meat processing) there was good co-ordination of activity between producer and processor this was not generally the case. It was felt that much of the research which is done at the production stage is too basic to be relevant to processors needs and interests. The desire for better communication and co-ordination of research between stages was present, even though the mechanisms were not.

DISTRIBUTION/RETAILING/CONSUMER INTERESTS:

The private sector representatives at this stage indicated that there was considerable co-ordination and communication of "research" activity on a vertical basis (i.e. between supplier and customer) but very little on a horizontal basis (i.e. among competitors). However, even at the horizontal level, the food distributing/retailing industry engages in considerable co-operation and co-ordination in conducting studies relating to standardization of pallets, shipping containers, metric conversion and other industry-wide issues.

There was general agreement among attendees that a "data bank" or central source of research information on the economics, technology and sociological trends affecting this stage of the food system was needed, and probably could be best maintained by one of the federal government departments such as Industry, Trade & Commerce or Consumer and Corporate Affairs.

Academics at this stage expressed the same constraints on funding, publication and research priorities as did academics at other stages. However, the problem of funding for multi-disciplinary research was particularly critical at this stage, since many of the problems did not lend themselves to only one area of expertise. Institutions such as the Nutrition Research Centre at Laval University, and the Veterinary Infections Disease Organization (VIDO) associated with the University of Saskatchewan were cited as examples of research centres which are struggling with the problems of funding for multi-disciplinary research.

Attendees at this stage also cited lack of federal-provincial government co-ordination and communication on food research as an inhibiting factor. While this same problem may exist at other stages of the food system, inconsistencies in policies and regulations regarding food processing, storage, transportation and merchandising were cited as an important factor in contributing to increasing food costs in Canada.

Nutritionalists attending the workshops expressed concern about the lack of co-ordination in research relating food nutrition problems to Canadian eating habits. Again, the need for, and problems with, multi-disciplinary research was cited as a major limiting factor.

V FUTURE RESEARCH PRIORITIES - AND THE ROLE OF
THE FEDERAL GOVERNMENT

GENERAL:

During the course of each workshop, the issue of future research needs and priorities was raised in response to the questions:

"What are the future critical needs for research for the total food system and your particular stage in it? What are the best mechanisms for meeting these needs?"

In addition we wished to explore with the attendees their perceptions of the role which the federal government should play in facilitating each stage's research priorities and needs. The question was asked:

"What is your view on the role and degree of participation which the federal government should play in food research and development?"

Originally it had been the intention to consider each of these issues separately. It soon became apparent, however, that the two issues were closely related. From the private sectors viewpoint the role of the federal government is to:

- (i) maintain a minimum "critical mass" of basic research activity;

- (ii) make more resources and financial incentives available to the private sector for applied research and product/market development work;
- (iii) establish and maintain a communications/co-ordination/information infrastructure involving university, private sector and government food research agencies.

While each stage of the food system was able to identify future research priorities and needs specific to that stage, there were several items clearly common to every stage. The first was the high priority placed on the need for greater emphasis on applied and developmental research. While it might be expected that the private sector would place a high priority on applied research, the point which was emphasized frequently was that the Canadian food system is not even fully utilizing the basic research information which is already available to it both from within, and outside Canada. To continue to emphasize basic research, particularly within the relatively narrow scope currently adopted, at the expense of applied research was "gilding the lily" and leading to duplications and overlapping of research activities.

The second common need perceived was for a higher priority to research in the social, engineering and economic aspects of the food system. It was felt that historically, and currently, too great a proportion of the limited resources have been allocated to the natural sciences, whereas the critical research requirements of the future will be to solve problems relating to processing and distribution costs,

the development of new markets (both domestic and export) for Canadian food products, changing consumer lifestyle and eating habits and the management of the total food system. Researching these problems will require a substantial reallocation of current research priorities and resources - and the development of new criteria for distributing resources between the various public and private sector research facilities.

The third common priority is for the establishment of a national, "total systems" research information and communications network. Such a network would include:

- (i) a "data bank" of historical current and anticipated food research projects which would help to eliminate the present duplication and redundancy of research effort and identify gaps in the natural food research program;
- (ii) mechanisms for greater industry input into establishing national and regional research priorities;
- (iii) a feedback system not only on the implementation of specific projects, but also on the development of food research policies and priorities for Canada.

These common needs and priorities lead to a definition of an "appropriate" role for the federal government in future food research.

- (ii) make more resources and financial incentives available to the private sector for applied research and product/market development work;
- (iii) establish and maintain a communications/co-ordination/information infrastructure involving university, private sector and government food research agencies.

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- (iii) a feedback system not only on the implementation of specific projects, but also on the development of food research policies and priorities for Canada.

These common needs and priorities lead to a definition of an "appropriate" role for the federal government in future food research.

At all stages there was a recognition that a "critical mass" of basic research should be sustained into the future. It was further acknowledged that this type of research required large investments over long time periods and could best be undertaken by government and/or university research resources. The balance of costs and payoffs and proprietary interests precluded most private sector organizations from investing in this type of research.

It was felt that a larger proportion than currently is the case of the total basic food research in Canada should take place in university research centres where technological transfer and communication of results could be facilitated.

Moreover, this would require two modifications of existing government research funding policies:

- (i) a greater acceptance of multi-disciplinary projects;
- (ii) extended time periods for assured funding.

For applied and developmental research, the private sector perceived one role of the federal government as "establishing a climate which would encourage the academic and private sectors to do more (applied) research in Canada". This "climate" involved substantially greater financial incentives, particularly in the form of tax reductions to the private sector and the opportunity to retain a proprietary interest in the research results at least for a minimum specified period of time, perhaps 1 or 2 years. It also involved the identification of explicit food

research priorities determined by extensive consultation with representatives from each stage of the food system. It was also felt that the federal government had a major responsibility in rationalizing its priorities with those of provincial governments in the process of establishing overall food research goals.

The federal government was also seen as having a major role to play in establishing a food research planning infrastructure in Canada which would recognize national, regional and sectoral food research interests and place increased authority at the regional and sector levels for the implementation of research programs. The development of an improved co-ordination and communications system for food research discussed in the previous section of this report would play a major part of the planning infrastructure.

VI CONSULTANT'S OBSERVATIONS AND CONCLUSIONS

In all of the foregoing the author has attempted to reflect as correctly as possible at least the major views and concerns of the workshop attendees regarding food research in Canada. In the concluding section, however, I wish to express some of my own observations and conclusions resulting from my role as moderator of the workshops and the opportunity when preparing this report to reflect on the outcome of the whole consultative process.

1. Converting Consensus into Commitment

As has been shown in other sections of this report there was a somewhat surprising degree of agreement among attendees, both within and between stages, on some very strategic issues, such as the allocation of resources between basic and applied research, the constraints of the present funding process, the "appropriate" roles for federal, provincial, academic and private research groups and the pervasive problems of co-ordination and communications.

Consensus, however, is not sufficient. What is needed is a mechanism to convert this consensus into commitment - commitment to national, regional and sector research priorities, commitment of physical and human resources and most importantly commitment of spirit to the need for food research in Canada.

I would emphasize the latter because of the degree of frustration, and sometimes complacency, which I observed during these workshops. On many occasions attendees expressed intense frustration at being unable to obtain any significant commitment from government or their contemporaries to a food research strategy for their respective stages of the food system, let alone for the total system. Indeed, I noted that several of the persons attending the workshops came with the attitude that they would try "one more time" to get their views and proposals put into action. However, if nothing tangible results from this current exercise, I believe that the opportunity to convert their consensus into commitment will be seriously diminished.

2. Food Policy Versus Agricultural Policy

While Canada may have a set of agricultural policies, it is apparent that it does not have a food policy. Without disrespect to the Ministers of Agriculture and Consumer and Corporate Affairs very few of the attendees found that the white paper "A Food Strategy for Canada" (which had just been released at the time of the workshops) adequately grasped the concept that a food policy must embrace all stages of the food system, not just producers and consumers, and that the research component of such a strategy must recognize and emphasize the food system as well as its individual components. In particular, a food strategy must embrace the social, economic, marketing and management dimensions of the system as well as its technological and natural science dimensions.

One of the reasons suggested for the current disjointed and imbalanced condition of food research in Canada today is the dominance of the federal Department of Agriculture in "food" research and the relatively focused perspective which this department appears to have on the production stage of the total food system.

Considering the historical evolution of this department in Canada's food affairs, and the reticence until recently of some of the other stages of the food system to shoulder their proportionate responsibilities, it is not surprising that we have an "agricultural" orientation rather than a "food" orientation to research in the field.

Nevertheless there is clearly a need for greater recognition of, and commitment to, the development of a total food policy/strategy among the key departments and agencies of the federal government, and particularly Agriculture Canada before many of the problems and proposals arising from these workshops can be acted upon.

3. "Bottom-Up" Versus "Top-Down"

In this report I have already noted the observation made by several attendees that "ideas and proposals go up the system but nothing ever seems to come down".

Without detailed investigations I cannot confirm or deny this contention. However, it does suggest to me that while there may be the consultative structures in place for "bottom-up" inputs to the food research planning process there may be very little opportunity for "bottom-up" decision-making. This feeling of impotence on the part of

the private sector in being part of the decision-making process as well as the information input process is reflected in their desire for regional and sectoral research planning, as well as a national research plan, and a reduction in the dominance of government objectives and priorities in the research funding process.

While it is accepted that the federal government does, and should have its own priorities and requirements regarding food research there possibly could be more of a participative democratic, "bottom-up" element in the decision-making process as well as the information input process. For example, I must question why there are no private sector representatives on the Task Force on Food Research. It is at this level that important decisions will be made regarding the food research priorities and programs to be considered by government. The information input process has been reasonably well served perhaps by these eight workshops and other more detailed government-industry meetings and discussions. But now, to many, the process seems "out of their hands".

While there may be some reduction in the "confidentiality" of the decision process by more involvement of the private sector this risk may be more than offset by the increased breadth of judgement and commitment to policies by the private sector which such participation could bring.

4. An Old Refrain:

In preparing for the eight workshops, I had the opportunity to read the "Background Study for the Science Council of Canada, 1970 Special

Study No. 10: Agricultural Science in Canada". At the conclusion of the workshops I again read this study, and particularly the 25 conclusions and recommendations which it contains (see Appendix 3). I was struck with a sense of dé-jà vu. Here, in a study done eight years ago and in much greater depth than could possibly be achieved in our eight workshops, were conclusions and recommendations which closely paralleled, and elaborated upon, the findings of this project.

Thus I must conclude that while this present project may make a modest contribution to updating our understanding of the interests and concerns of the private sector regarding food research, essentially we have played an old refrain.

In conclusion, therefore, I recommend that the Interdepartmental Task Force on Food Research accept as valid the conclusions of the Science Council of Canada's 1970 Special Study No. 10, modified only by interviewing events and even greater attention now to the total food system concept, and that these be the basis for a new food research strategy for Canada.

APPENDIX I: LIST OF ATTENDEES TO WORKSHOPS

Farm Inputs Workshop

June 27, 1977

Ottawa

Mr. Curtis Friend
Canadian Feed Manufacturers Association
574 Laurier West (Station D)
Ottawa, Ontario
K1P 5W3

Mr. W.S. Kilmer
Executive Director
Canadian Seed Trade Assoc.
100 Dixie Plaza, Suite 210
Mississauga, Ontario L5E 1V4

Mr. Stahl
John Deere Limited
Box 1000
South Service Road at Hunter
Grimsby, Ontario
L3M 4H5

Mr. John Stewart
Ceba-Geigy Seeds Limited
Ailsa Craig, Ontario

Mr. R. Neal
Canadian Fertilizer Association
350 Sparks Street
Room # 602
Ottawa, Ontario

Dr. D.W. Kelly (Chairman)
Public Affairs International Ltd.

Dr. George Cooper
Cyanamid of Canada
Plaza 1200
Agentinia Road
Mississauga, Ontario
L5N 1P7

Ms. K. Campbell
MOSST

Production Workshop

June 22, 1977

Ottawa

Dr. H. Nonnecke
Department of Horticultural Science
University of Guelph
Gordon Street
Guelph, Ontario
NKG 2W1

Dr. Don Kelly (Chairman)
Consultant
Public Affairs International Ltd.

Mr. Clifford Luce
Senior Vice President
Shaver Poultry Breeding Farms Ltd.
Box 400
Cambridge, Ontario
NIR 5V9

Ms. Kathleen Campbell
Secretary
MOSST

Mr. Glenn Flaten
c/o Canadian Federation of Agriculture
111 Sparks Street
Ottawa, Ontario
K1P 5B5

Mr. Iain C. Neish, Ph.D.,
Vice-President
Research and Development
Marine Collaids Limited
P.O. Box 2610
Dartmouth, East, Nova Scotia

Mr. Clive Tisdale, P. Ag.
Secretary-Manager
Canadian Consulting Agrologists Assoc.
Suite 22
44 Wellington Street E.
Toronto, Ontario
M5E 1C8

Production & Distribution Workshop

May 31, 1977

Saskatoon

Mr. Don Dever
Secretary General
Canada Grains Council
177 Lombard Avenue
Winnipeg, Manitoba

Dr. E. Stobbe
Plant Science Department
University of Manitoba
Winnipeg, Manitoba

Mr. Chris Hansen
Assistant Secretary
Saskatchewan Wheat Pool
2625 Victoria Avenue
Regina, Saskatchewan
S4P 2Y6

Dr. Donald W. Kelly
Chairman

Mr. C.H. Bigland
Director, VIDO
University of Saskatchewan
Saskatoon, Saskatchewan
S7N 0W0

Ms. Kathleen K. Campbell
MOSST

Dr. John Zahradnik
Bio-Resources Engineering
University of B.C.
Vancouver, B.C.

N. Jane Teeter
MOSST (minutes)

Processing Workshop

May 24, 1977

Vancouver

Dr. W.D. Powrie
Chairman
Department of Food Science
University of B.C.
Vancouver, B.C.

Mr. Frank L. Greene
Research Manager
Sun-Rype Products Ltd.
1165 Ethel Street
Kelowna, B.C. V1Y 7N6

Mr. David H. Barbour
Director
Product Assurance and Development
B.C., Product Assurance and Development
B.C. Packers Ltd.
Box 5000
Vancouver, B.C.
V6B 4A8

Dr. Donald W. Kelly
P.A.I. (Consultant)
Chairman

Mr. G. Stan Boulter
Chairman of the Board of Directors
P.O.S. Pilot Plant Corporation
The University Campus
University of Saskatchewan
Saskatoon, Saskatchewan
S7N 2R4

Ms. Kathleen Campbell
MOSST

(Also Executive Director,
Rapaseed Assoc. of Canada
Room G-11, 355 Burrard Street
Vancouver, B.C.
V6C 2G6

N. Jane Teeter, (minutes)
MOSST

Processing Workshop

June 6, 1977

Toronto

Mr. Jack McCrae
Christie Brown and Company Ltd.
2150 Lakeshore Blvd. West
Toronto 14, Ontario

Mr. Howard Schneider
J.M. Schneider Inc.
321 Courtland Ave. E.
Kitchener, Ontario N2G 3X8

Mr. Trevor Stevens
Canadian Cannery Research Center
Box 5032
1101 Walkers Line
Burlington, Ontario
L7N 2G4

Dr. John Wenzel
The Griffiths Laboratories Ltd.
757 Pharmacy Avenue
Scarborough 705, Ontario

Mr. Bert Shelton
John Labatt Limited
451 Ridout Street
London, Ontario

Dr. Leon Rubin
Canada Packers Ltd.
2211 St. Clair Ave. W.
Toronto, Ontario M6N 1K4

Mrs. Gail Holland
Meat Packers Council of Canada
5233 Dundas Street
West
Islington, Ontario

Dr. Donald Kelly (Chairman)
Ms. Kathleen K. Campbell (MOSST)
Ms. N. Jane Teeter (MOSST)

Distribution & Marketing Workshop

June 14, 1977

Ottawa

Mr. Alastair Smith
Vice President
Retail Council of Canada
74 Victoria Street
Suite 525
Toronto, Ontario M5C 2A5

Mr. John Jackson
National Dairy Council
365 Laurier Avenue West
Ottawa, Ontario

Mr. E.F. Findlay
President
Silverwood Dairies Limited
75 Bathurst Street
London, Ontario

Dr. René Riel
Agriculture Canada
Sir John Carling Building
Ottawa, Ontario

Mr. Arnold Steinberg
Steinbergs Limited
1500 Atwater Street
Montreal, Quebec

Dr. Donald Kelly (Chairman)
Ms. Kathleen Campbell (MOSST)

Marketing & Consumption Workshop

June 16, 1977

Ottawa, Ontario

Dr. Elizabeth Gullett
College of Family and Consumer Studies
University of Guelph
Guelph, Ontario

Dr. Jacques Goulet
Department de Vivres
Université Laval
Quebec, Quebec

Dr. Don Jarvis
Public Affairs Manager
Canada Safeway Limited
2323 Yonge Street
Toronto, Ontario
M4P 2G9

Mr. Barry Melsom
c/o Lever Bros. Limited
1 Sunlight Park Road
Toronto, Ontario
M4M 1B6

Dr. G. Brisson
Nutrition Research Center
Université de Laval
Ste Foy, Quebec

Dr. Don Kelly (Chairman)
Ms. N. Jane Teeter (MOSST)
Ms. Kathleen Campbell (MOSST)

Food Systems Workshop

June 30, 1977

Ottawa

Dr. A.E. Hannah
Assistant Deputy Minister
Food Systems Branch
Agriculture Canada
Room 849
Sir John Carling Building
Ottawa, Ontario
K1A 0G5

Mr. Steve Hart
Policy Analyst
Dept. of Fisheries and the
Environment
Fontaine Building
Ottawa, Ontario
K1A 0H3

Ms. Yvonne Miles
208 Governors Road
Dundas
Ontario

Mr. Charles Beaubien
Science Council of Canada
150 Kent Street
Ottawa, Ontario K1P 5P4

Dr. Joe Richter
Faculty of Rural Economy
University of Alberta
Edmonton, Alberta

Mr. G. Hiscocks
Policy Coordination Branch
Consumer & Corporate Affairs
Hull, Quebec

Mr. Elmer Banting
Executive Vice President
Canadian Food Processors Association
1409-130 Albert Street
Ottawa, Ontario

Mr. Bob Fletcher
Advanced Concepts Centre
Dept. of Fisheries and the
Environment, Fontaine Bldg.
Ottawa, Ontario K1A 0H3

Mr. N.R. Richards
Chairman
Canadian Agricultural Research Council
Department of Land Resource Science
O.A.C., University of Guelph
Guelph, Ontario

Mr. René Riel
Food Research Coordinator
Research Branch
Agriculture Canada
Sir John Carling Building
Ottawa, Ontario K1A 0G5

Dr. R.M.A. Loyns
Department of Agricultural Economics
University of Manitoba
Winnipeg, Manitoba
R3T 2N2

Dr. Don Kelly (Chairman)
Consultant, P.A.I.
Ms. Kathleen Campbell (Secretary)
MOSST

APPENDIX II: SOME DEFINITIONS USED FOR THE WORKSHOPS

Research

Research and experimental development comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Basic Research

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

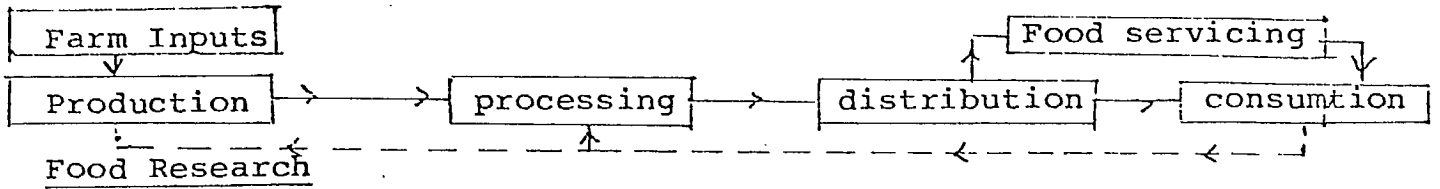
Applied Research

Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

Experimental Development

Experimental development is systematic work, drawing on existing knowledge gained from research and for practical experience, that is directed to producing new materials, products and devices, to installing new processes, systems and services, and to improving substantially those already produced or installed.

The Food System



Basic and applied research and development relating to the total food system, both in the natural and in the human or management sciences.

APPENDIX III: SUMMARY AND CONCLUSIONS OF THE 1970 SPECIAL STUDY NO. 10
FOR THE SCIENCE COUNCIL OF CANADA

Summary of Conclusions

The Study Group concludes that:

1. Canada should establish an Agricultural Research Board, with representation from all sectors performing or funding agricultural R & D, to advise and recommend to the federal Minister of Agriculture on the conduct and development of an integrated Canadian program.

The Board would:

- a) maintain a small permanent secretariat supplemented as necessary by experts employed or seconded to undertake special studies;
- b) function to design and co-ordinate a Canadian policy and program by advice to the Minister on priorities and funding, and through its influence with the performing agencies;
- c) exercise substantial powers for managing, through grants and contracts, the orderly development of a balanced program within and between the performing agencies.

Chapter IV, page 52

2. Canada should establish a Renewable Resources Research Council composed of the Chairmen of Research Boards (or bodies equivalent to the Agricultural Research Board) for agriculture, fisheries, forestry, water resources, and wildlife, to effect co-ordination and to exploit opportunities for collaboration in the scientific management of the nation's renewable resources.

Chapter IV, page 53

3. A major readjustment between the disciplinary components of agricultural R & D is urgently required to achieve a substantially greater capability in the management sciences of economics, engineering, and sociology, relative to the current emphasis on the natural sciences; and furthermore, the costs of this readjustment should be met in large part, and over a limited period, by transfers of a proportion of the normal turn-over in the natural sciences, with due regard for the continued viability of this component.

Chapter V, page 61

4. The Federal Government should contract with the provincial governments for the total management of a number of federal research stations and soil survey units, thus to promote increased emphasis on local development work and increased provincial responsibility for managing agricultural R & D in their own interests.

Chapter V, page 61

5. The Federal Government should reduce its responsibilities for the performance of agricultural R & D in favour of increased performance by the provincial and private sectors, and the costs of this readjustment should be met in large part by transfers of normal turn-over, or dollar equivalents, in the natural science component of the federal sector.

Chapter V, page 61

6. The Federal Government should increase its responsibility for the funding and co-ordination of this nationally important activity coincident with reducing its relative role as a performer of agricultural R & D.

Chapter V, page 63

7. The agricultural industries, both primary and secondary, should be supported and should themselves participate as a major force in agricultural R & D at all levels from national policy and decision-making to research, development, and innovation in their own interests, in collaboration and without competition from publicly supported agencies, and the preferred financial interest of commodity groups of producers should be exploited and directed mainly toward management studies in their area of interest; all this, we believe, in the interests of maintaining the relevance of agricultural R & D to modern agriculture and for the benefit of the Canadian economy.

Chapter VI, page 91

8. Interdisciplinary research, particularly the interaction between the natural and management sciences, should be encouraged and supported by educational preparation, by establishment of the interdisciplinary research centres we have proposed elsewhere, and by the use of scientific task forces for specific problem-solving, thus to improve the developmental end of agricultural R & D and to promote the integration of knowledge for the holistic management of agricultural problems.

9. The universities should actively seek and promote collaboration with government and industry research establishments in the education of graduate students, thus to maximize the use of manpower and facilities for the production of agricultural scientists and to provide a continuing mechanism for the improvement of communication between agencies.

Chapter VI, page 85

10. Agricultural technical assistance should be recognized as a major means for meeting Canada's responsibilities for international development; should be exempt from current financial constraints in Canadian development assistance policy; and should be implemented through the specified educational and development programs in selected disadvantaged countries, with due regard for the special capabilities and responsibilities of the provincial governments, and the central co-ordination function of the proposed Agricultural Research Board.

Chapter VII, page 97

11. An annual increment, currently estimated at 6 per cent, should be applied to all budgets for agricultural R & D as a matter of necessity to maintain the viability of agricultural scientists and the quality of research programs in the face of the increasing inflation and sophistication costs of research.

Chapter V, page 59

12. Within existing programs high priorities should be given to marketing research throughout the entire food industry from producer to consumer, studies on rural adjustment, systems engineering in livestock production, biomathematics, food research, and plant cell research.

Chapter V, page 63

13. Within new programs, an Agricultural Centre for Bio-economics Research and Development should be established to develop model systems for integrating research in economics and the natural sciences to yield principles of management and advice for optimizing the production and marketing of agricultural products.

Chapter V, page 66

14. A Population Ecology Research Centre should be established to develop principles for applying scientific knowledge to the purposeful management of populations of cultivated plants, domestic animals, and agricultural pests and diseases, by using a broad mix of disciplines and the methods of systems analysis and operations research.

Chapter V, page 69

15. A Research Centre for Rural Adjustment should be established to promote research on the pervasive social factors involved in the technological transformation of agriculture, its repercussions on rural life, and the social adjustments necessary to optimize the benefits for rural people.

Chapter V, page 70

16. An Atlantic Resource Management Centre should be established to develop a capability for the multidisciplinary application of scientific knowledge required to direct the large-scale adjustment and development of Atlantic industries based on renewable resources, including agriculture.

Chapter V, page 71

17. A Research Centre for Cold and Drought Resistance should be established to intensify basic research on the physiology, biochemistry, and genetics of resistance to cold and drought, thus to seek means for extending current efficiencies of crop production in Canada.

Chapter V, page 72

18. A new program of graduate student support in the management sciences should be inaugurated and funded at the levels and with the checks suggested, thus to produce the additional engineers, economists and sociologists required for readjustment within existing programs, and to staff the proposed new programs.

Chapter V, page 74

19. Research on the characteristics of the education, employment, and motivations of agricultural scientists should be undertaken to guide and maximize the diverse talents of individual scientists and to foster fruitful collaboration between them.

Chapter VI, page 79

20. Employers of agricultural scientists should institute appropriate forms of periodic educational leave as a norm of the employment of scientists, thus to protect from obsolescence their most valuable asset.

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21. Longer probationary periods should be used to evaluate and orient young scientists before tenure is granted; and evidence of research versatility should be included in the criteria for the promotion of agricultural scientists.

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22. A significant proportion of the budget for governmental agricultural scientist positions should be converted, as vacancies allow, to a new class of position reserved for the employment of scientists on short-term contracts for specific research objectives, thus to counter the tendency towards perennial projects and to provide a means for quickly responding to changing priorities and opportunities.

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23. Directors of government agricultural research establishments should be assigned full authority for the tactical management of their resources to achieve the broadly defined objectives assigned to their establishments.

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24. A formal program of temporary transfers of scientists between agencies conducting agricultural research should be initiated to improve active collaboration, to promote interaction and communication, and to counter parochialism.

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25. The National Advisory Committees for agricultural R & D should be placed under the sponsorship of the proposed Agricultural Research Board.

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