Chapter 4

Alternative Policies for Research and Technology Transfer

The main premise of this report is that a broadening of research problems and the beginning of a new era in technology will present serious challenges to the AR&E system. The preceding discussion regarding mission, planning, priority setting, structure, and funding indicates that the system may not be able to effectively respond to these challenges.

Agricultural research and technology transfer policy will once again be a major focus of debate in the 1990 Farm Bill as it has been in the past two farm bills. The debate will likely center on the level and type of Federal appropriations for, and the planning and control of agricultural research and extension.

The lack of increased real funds for agricultural research has received much attention, most recently in the National Research Council report *Investing* in *Research,* to be discussed later. However, until there is a well articulated and coordinated research and technology transfer policy, debate about allocating new funds to the system is premature.

Effective planning to develop goals, determine priorities, commit resources and measure progress within the AR&E system is also crucial. Many within and outside the system complain that too much planning already exists. Most planning efforts, however, are relatively ineffective. Planning is not easy in a research system involving five Federal agencies, 57 state experiment stations, 50 extension services, and about 3,000 county extension offices.

Complicating the issue is the combination of Federal and state funds for agricultural research, and of Federal, state and county funds for extension. Each sector claims a dominant role in the system.

An effective system of Federal planning should consider, above all, the views of those who ultimately use the products of research and technology transfer services. The results of a user-oriented Federal planning system should be consistent with user-oriented state and local planning efforts. They certainly should not be contrary to state and/or local interests.

Planning must identify an appropriate balance of formula funds and competitive grants for agricultural research and extension. Large competitive research grants may create a serious imbalance between research and extension. Interestingly, proposals for substantial increases in competitive grants funding relate almost entirely to research. In reality, there may be an equally pressing need for competitive grants to develop education programs and extension expertise in a time of rapidly changing technology (8).

OTA proposes three alternatives for a national agricultural research and technology transfer policy:

- Continuation of the current policy as implemented under the 1985 Farm Bill, referred to hereinafter as the “status quo.”
- Development of a larger Federal role in planning to align more closely research and end-user needs, without necessarily engendering large increases in aggregate funding levels, referred to hereinafter as the “national research and extension policy alternative.”

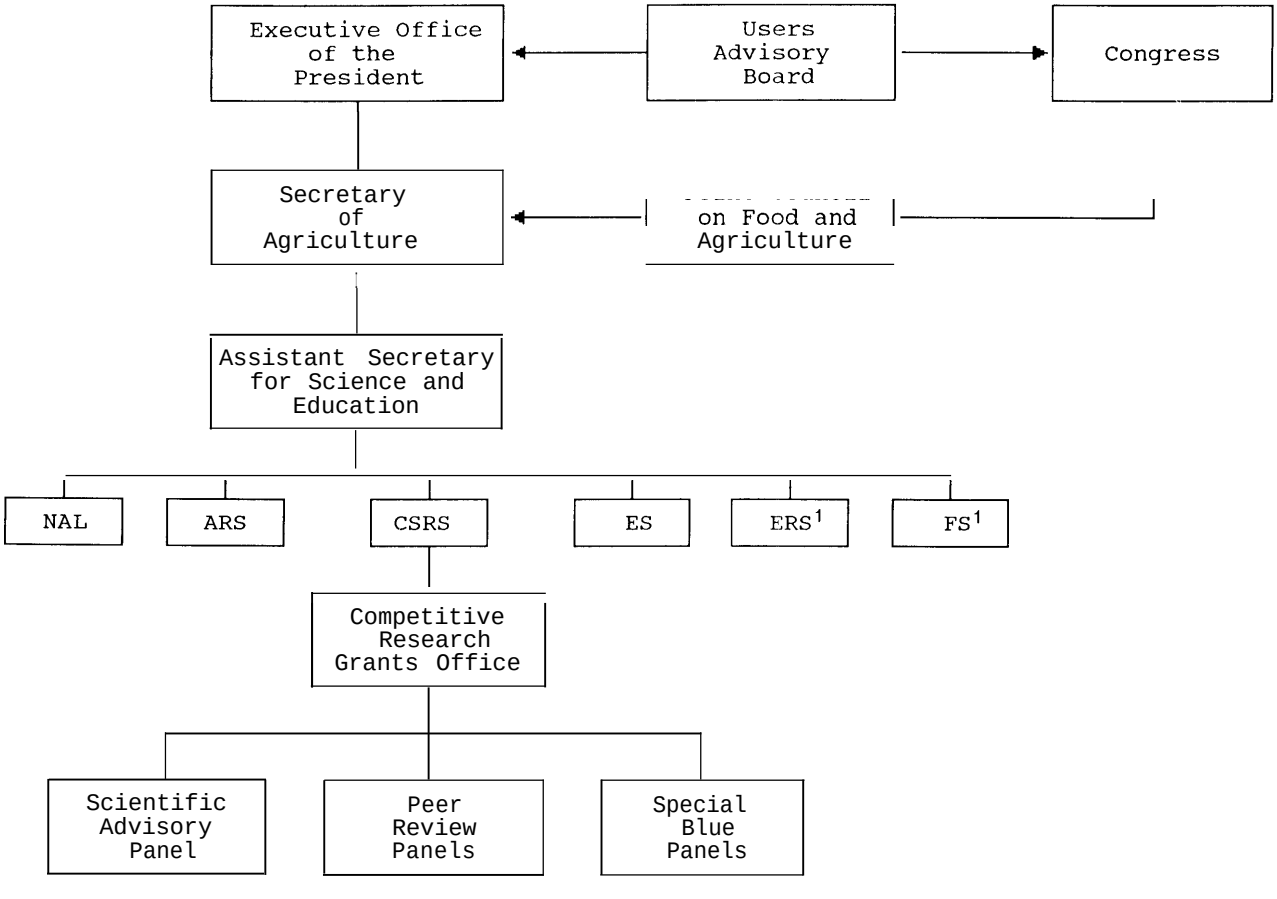
. Substantially increase the level of competitive grants research while continuing current levels of formula funding and/or appropriated funding for research and extension, referred to hereinafter as the "competitive grants alternative."

STATUS QUO ALTERNATIVE

A simplified schematic drawing of the current organizational structure of agricultural research and extension is shown in figure 4-1. While by statute the Users Advisory Board (UAB) reports to the White House, in practice it reports to USDA as does the Joint Council. It is difficult to depict accurately the complexities of the agricultural research and extension system in a single chart. Underlying virtually each component of the system is a series of national, regional, state, and local (extension) planning groups. For example, the Experiment Station Committee on Policy (ESCOP) reviews and establishes priorities as input into the Cooperative State Research Service (CSRS) budget process. Likewise, the Extension Committee on Policy (ECOP) reviews and establishes priorities as input to the Cooperative Extension Service budget process. An extensive six year planning function also occurs in the Agricultural Research Service (ARS) (8).

Based on the findings in this report and in previous OTA reports dealing with the AR&E system, maintaining the status quo will have the following consequences:

Figure 4-l-Current Organizational Structure for Agricultural Research and Extension



[1]ERS and FS report to separate and different assistant secretaries

SOURCE: Office of Technology Assessment.

1. The new era of biotechnology and information technology will likely bypass the traditional AR&E system. Advances in these areas combined with changes in public policy regarding patent rights, have shifted the balance of agricultural research expertise in the direction of private sector firms and non-land-grant universities. A minority of the land-grant universities will remain competitive in this new era.

2. The lack of a clearly enunciated mission-oriented policy for the AR&E system means the system will continue to lack direction and focus.

3. Planning and priority setting within the system will continue to be ineffective. No mechanism exists to assure follow-through on initiatives or on recommendations of the Joint Council and/or Users Advisory Board. There is much planning but little resulting action.

4. The AR&E system will continue to be structured in a way that does not allow it to change easily.

5. Increased emphasis by land-grant universities and USDA on basic research, combined with accelerated technical change and continued neglect of applied research needs, will continue to expand the knowledge gap between research and extension. Extension has made an effort to improve its responsiveness to contemporary concerns through its national initiatives efforts. However, without commensurate shifts in the allocation of Federal funds to these specific initiatives, national impacts are difficult to detect and quantify. Extension continues to be "all things to all people" without specifically narrowing its priorities and allocating its resources to those priorities.

NATIONAL RESEARCH AND EXTENSION POLICY ALTERNATIVE

The National Research and Extension Policy Alternative is the product of OTA deliberations based on its analysis of the status quo. It is a mission-oriented approach designed to increase the responsiveness of the AR&E system to the needs of the food and agriculture system.

One principle problem with the current AR&E system is the lack of effective planning and its inability to respond to change. While the Congress has attempted to make the system more responsive through the formation of the Joint Council and UAB, the overall system resists change. The National Research and Extension Policy Alternative is designed to create a more responsive and better-coordinated AR&E system. The major components of this system include:

- A clearly enunciated mission-oriented AR&E policy.
- A restructured integrated and coordinated AR&E planning system.
- A combination of formula and competitive grant funding consistent with planning and political realities.

AR&E Policy

The first, and perhaps the most important component of the National Research and Extension Policy Alternative is a statement of clearly enunciated policy supported by the Secretary of Agriculture. While it can be argued that all secretaries of agriculture have supported the agricultural research and extension system – the original purpose for which the USDA was established – a policy statement of the type contemplated by this

alternative has never been made. Such a statement could articulate the following principles to be implemented by all USDA- agencies:

- Research and extension will be integral to carrying out agricultural, food, trade and rural policy in all dimensions. Thus, every USDA action agency will be required to consider seriously its research needs when developing and implementing its programs. Likewise, USDA research and extension must be responsive to the research and technology transfer needs of the action agencies.

- The research and extension functions of USDA will be operated according to a plan. The broad outlines of this plan initially will be developed by an Agricultural Science and Education Policy Board (ASEPB) (discussed later). The plan will emphasize the Federal role in the agricultural research and extension system but leave room for state and local planning. More detailed planning will be expected within individual USDA research and extension agencies and at the state and local levels.

- The research and extension system will be mission-oriented with significant user influence on the planning process and on resulting research and education programs. (USDA and the land-grant system were created with a clear focus on mission-oriented problem solving.)

- Research and technology transfer functions will be carried out by the scientists/institutions most competent to efficiently achieve mission-oriented objectives. This implies no predetermined mix of competitive grants and formula funds. The optimum mix would be expected to change over time and be tuned to the specific nature of the problem. Action agencies may best be served by ARS or ERS funding, while certain types of mission-oriented basic research or the development of extension education materials may best be supported by competitive grants. This means relatively more emphasis on competitive grants for research and extension and less on predetermined formula funding.

Research and Extension Policy Planning System

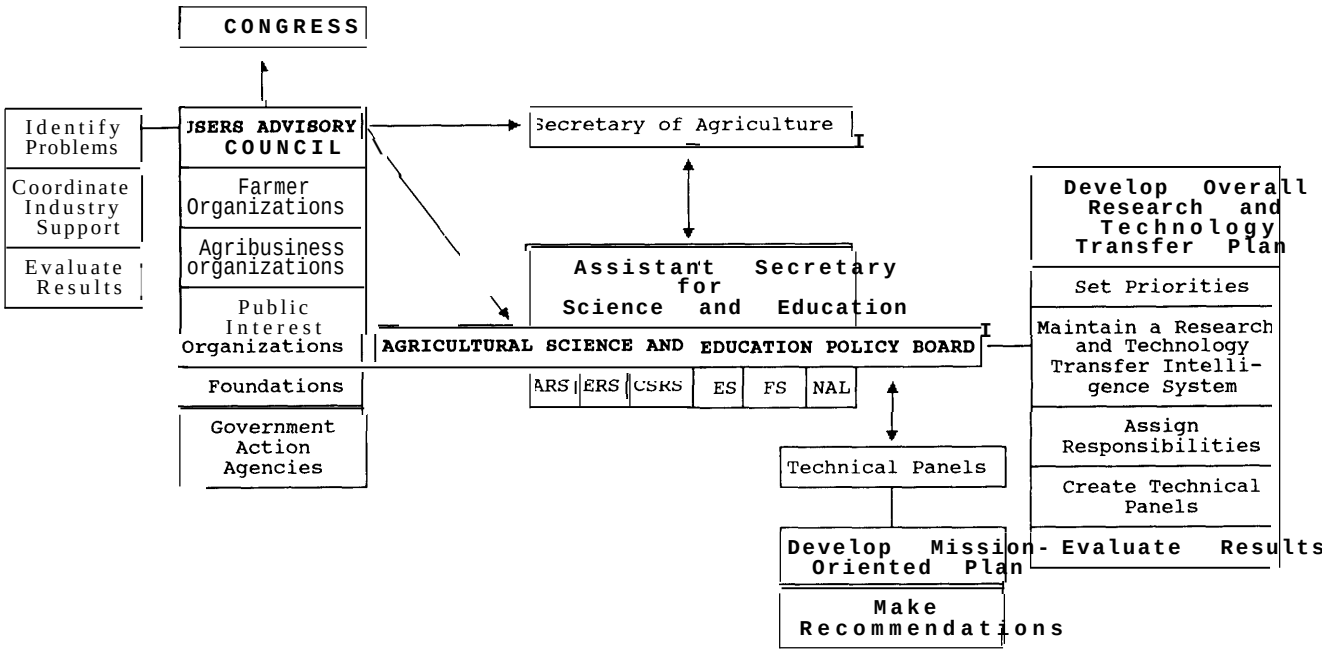
The proposed policy statement implies a user-oriented research and extension system that places increased emphasis on competitive grants in research and extension programs. The structure of the system is illustrated in figure4-2. The key planning components include:

- Users Advisory Council (UAC)
- Agricultural Science and Education Policy Board (ASEPB)
- Technical Panels
- Existing research and extension agencies
- Secretary of Agriculture
- Assistant Secretary for Science and Education (as ASEPB chair)

Federal research and extension planning activities would be operationally centered in ASEPB. However, the planning process itself begins in UAC, reflecting the user- and mission-oriented basis of the system. Planning functions are also included in research and extension agencies at the Federal, state and local levels.

Users Advisory Council. UAC input would be considerably expanded beyond that

Figure 4-2-Organizational Structure for National Research and Extension Policy Alternative



SOURCE: Office of Technology Assessment.

of the current Users Advisory Board (UAB). Its primary functions would include:

- Identification of important research and technology transfer problems.
- Development of recommendations on goals and funding levels.
- Coordination of industry support for agricultural research and extension at the Federal level.
- Evaluation of results.

The results of the UAC'S efforts would be reported regularly to ASEPB and annually to the Congress. UAC would be a quasi-public, quasi-private entity in that most of its active participants would be private organizations and foundations whose mission would be helping to plan public research. USDA action agencies or other interested public agencies would be involved in its deliberations.

UAC would be composed of board members representing:

. Farmers and farm organizations

. Agribusiness firms and associations

. Public interest groups

. Foundations

. USDA action agencies

In contrast to the UAB which is appointed by the Secretary, UAC board members would be elected to represent and would serve at the pleasure of the above groups.

Each group could include specialized segments. For example, agribusiness might include a representative from input supplies, food processors, and exporters. Farm groups might include commodity groups, general farm organizations, and cooperatives. It is suggested that the total membership on UAC not exceed 25.

Membership on UAC could be a part-time to full-time job. Members would be sought who have considerable scientific expertise and contact with clientele. UAC could be entirely a privately financed operation or it could be a joint public/private undertaking. It could operate much like producer checkoff programs with public accountability for its operations.

To participate in UAC on an active basis, some agricultural associations/action agencies would have to improve substantially their understanding of their research and technology transfer responsibilities. Each group would have to establish methods for deciding research and technology transfer priorities. The best organized member group would likely have the greatest influence on UAC decisions.

UAC would produce a set of recommendations regarding research goals and funding levels. In certain instances, joint public/private research undertakings may be recommended, and a commitment made for private funding support to tackle particularly complex problems. In addition to annual recommendations, UAC would produce interim reports as appropriate. UAC would interact with ASEPB on a continual basis.

Agricultural Science and Education Policy Board. ASEPB would be the research and technology transfer planning center for USDA. In contrast to the current Joint Council, it would have a single chair, the Assistant Secretary for Science and Education. It would include the following members who would be appointed by the Secretary of Agriculture, or other relevant agency head in the case of NIH and NSF:

- Assistant Secretary for Economics
- Administrator of each USDA research and technology transfer agency (ARS, ERS, CSRS, FS, ES, NAL)
- ESCOP chairman or designated representative (experiment station representative)
- ECOP chairman representative (extension representative
- RICOP chairman or designated representative (resident instruction representative)
- One 1890 university dean or designated representative
- AASCARR chairman or designated representative (non-land-grant-representative)
- NIH administrator or designated representative
- NSF administrator or designated representative

Experiment stations and extension services would be equally represented on

ASEPB. However, total scientific representation would be weighted toward research. NIH, NSF, and AASCARR representation is designed to secure increased coordination among the basic and applied research components as well as between the land-grant and non-land-grant components of the system.

Those ASEPB members who are not administrators of Federal agencies would serve for appointed or elected terms of no more than four years. All costs associated with ASEPB would be borne by USDA.

ASEPB Functions. ASEPB would manage the Federal research and extension mission-oriented planning process and oversee the allocation of competitive grants for research and technology transfer. In terms of specific functions, ASEPB would:

Produce a Rolling Five Year Agricultural Research and Extension Plan. This plan would set forth major goals, priorities, and means for achievement, and be transmitted to the Secretary of Agriculture annually for endorsement and to the Congress.

. *Establish Goals. The* plan, with input provided by UAC, would set forth specific, measurable goals for the system. For example, instead of merely identifying water quality as a problem, it would consider how to reduce nitrates in well water by 25 percent by 1993.

• *Establish Priorities.* The key to an effective planning system is the establishment of priorities within the overall budget constraints prescribed by the Administration and the Congress. UAC input would be an important component of the priority-setting process. The established priorities would have major impacts on funding allocations and competitive grant decisions.

Ž *Maintain Intelligence System.* To operate effectively, ASEPB would need to identify the major centers of research and technology transfer expertise. It would probably need to maintain a scientific talent data bank, which could be located in the National Agriculture Library.

. *Create Technical Panels. The* technical panels would develop general plans, approaches, and recommendations for tackling particular priority problems (see below).

. *Determine Responsibility.* ASEPB would need to determine which agency holds responsibility for tackling specific priority problems. Responsibilities may be delegated to particular agencies or combinations of agencies that would thereafter be accountable for funding and maintaining progress. The ultimate authority for designating responsibility would lie with the Assistant Secretary for Science and Education.

• Evaluate *Results.* Performance of the research and extension system in pursuing the goals set forth by the planning process would be assessed by ASEPB as a basis for future planning and funding.

To perform these functions effectively, ASEPB would require a staff to assist in planning and evaluation. Each agency might be asked initially to contribute staff with qualifications specified by ASEPB, although in the long run a combination of permanent and assigned staff may provide a desired mix of expertise.

In the ASEPB framework, the USDA research and extension agencies would continue to operate with the same general responsibilities they now have. However, their programs would be affected by decisions made in ASEPB. Through representation in

ASEPB, USDA would participate in making these decisions.

Technical Panels. Technical panels would be established by ASEPB for each major research and technology-transfer priority. These panels would contribute scientific input and expertise to the process of planning to complete missions and solve problems relevant to the priority.

Panels would be temporary although they might be reconvened to monitor progress on a particular priority and to develop additional recommendations. Panels would be of the minimum size required to include expertise on all dimensions of the mission, including its basic science, applied research, education, social and economic dimensions. Research and extension, as well as the private sector, would be represented.

Each technical panel would have four primary responsibilities:

- Define the dimensions of research and technology transfer encompassed by its mission.
- Delineate the alternatives and recommended research and technology transfer approaches for dealing with its mission.
- Describe the centers of expertise (public and private, land-grant and non-land-grant) relevant to its mission.
- Make recommendations regarding the appropriate overall level and mix of available funding. The technical panel would not make finding decisions nor would it be a substitute for peer review of funding proposals. Those responsibilities would continue to lie with the relevant agencies (ARS, ERS, CSRS, FS, ES). However, members of the panel might logically also serve on peer review panels.

Reports of technical panels would be transmitted directly to ASEPB to help guide its decisions regarding the research and extension plan.

Secretary of Agriculture. The role of the Secretary of Agriculture is to provide leadership and to convince the Administration of the importance of agricultural research and extension functions. The Secretary needs to support the planning process, the overall thrust of the plan, and its major priorities in pleading the case for funding within the Administration. And, the Secretary needs to establish policy regarding the cooperation of all affected Assistant Secretaries. Likewise, ASEPB and the related agencies need to be responsive to the priorities established by the overall political process within which policy and funding decisions are made.

AR&E Funding

Under the policy of the National Research and Extension Alternative, funding initiatives come directly from ASEPB and from UAC. The Secretary, having overtly adopted the ASEPB policy, would likely support ASEPB recommendations in negotiations with OMB.

UAC would be much more active in pressing the case for appropriations with the Administration and the Congress than the current UAB. Its effectiveness would be enhanced by the direct involvement of all major interest groups in research and extension decision processes.

This alternative would probably increase the relative importance of competitive-grant funding. More discretionary funds seem to be inherent to a system driven by effective user-

oriented planning and by the goal of engaging the best scientists in research and technology transfer activities. Increased competitive-grant funds for research and extension, however, would not come at the expense of formula funds in this alternative. The appropriate mix of formula funds and competitive grants would nonetheless be determined by the deliberations of the technical panels, UAC, ASEPB, the Secretary, OMB and the Congress.

One of the most agonizing issues would be whether to continue Federal support for AR&E activities in every state. There is no easy answer to this and considerably greater study of this issue is required. A tradeoff between efficiency and the survival of specific state/local institutions could be involved. However, if serious attention is given to the missions, policies, and priorities on a national basis, each state would have an opportunity to establish its own role in the system.

Likely Consequences of National Research and Extension Policy Alternative

While all USDA research and extension agencies would remain intact, this alternative would change considerably the structure of research and extension, with attendant disruptive effects. These effects may be viewed positively or negatively, depending on one's perspective. However, if the current planning system is acknowledged to be flawed in light of changing conditions and if most of the following predicted consequences occur, then adoption of this policy alternative should have a positive impact overall.

Likely consequences are:

. The role of Federal planningintheAR&E system would increase. Increased emphasis on Federal planning would reduce the dominant role of state-oriented planning, and some responsiveness to local grassroots-expressed needs could decline. However, if the UAC and ASEPB are working properly, increased grassroots responsiveness could be anticipated at the Federal level.

- The USDA would have an internally consistent AR&E policy. The Secretary of Agriculture would be directly involved in establishing, monitoring, and endorsing AR&E policy. Thus, AR&E would have greater visibility within USDA than it now does.

- A basis would exist for effective, mission-oriented AR&E planning. Research funding would be allocated towards programs not agencies. The argument that too much planning already exists results largely from the ineffectiveness of current planning and follow-through.

- Multidisciplinary research would increase. Increased integrationof biological(CSRS, FS and ARS) and economic (ERS) research would occur through ASEPB, UAC and the technical panels. Extension considerations would also bean integral part of the planning process

- The use of formula funds and competitive grants would be more balanced.

- Certain research and extension functions could become more concentrated in the hands of agencies and/or institutions that have the greatest expertise. This process is gradually occurring under the status quo policies, but would likely accelerate. Some agricultural research and/or extension components may not be viable at some land-grant universities. Choices would need to be made as to where efforts (expertise) and resources are to be concentrated to secure Federal support that can be matched with state resources. Some institutions may decide not to seek Federal competitive grants for any of their programs. Some may discontinue certain agricultural

research and/or extension functions and/or contract for them with other states. Some functions could be performed on a regional basis by mutual consent of those institutions involved.

- A mechanism would exist through the UAC for more effective user input into AR&E decisions. This may lead to a more effective lobby on behalf of AR&E before the Congress and within the Administration. The technical panels and peer review of competitive grants would buffer this increased political clout and satisfy the need for objectivity in science.

- Potential would exist for increased financial support for the AR&E system with improved planning, priority setting, and integration of research and extension.

COMPETITIVE GRANTS ALTERNATIVE

The Competitive Grants Alternative was developed by the Board on Agriculture of the National Research Council, National Academy of Sciences in the report lnvesting in *Research*. This proposal recommends:

. Establishing a $500 million agriculture, food, and environment competitive research grants program within USDA to support national research initiatives in public and private universities and colleges, not-for-profit institutions, and research agencies of the state and Federal Government. The Competitive Grants Alternative would encompass all science and technology relevant to research needs for agriculture, food, and environment ranging from basic biology to the social sciences and public policy.

- Placing major emphasis on fundamental and mission-linked multidisciplinary research. Mission-linked multidisciplinary grants would be designed to facilitate application of knowledge and the transfer of technology to the user through joint research-extension studies.

- Providing research strengthening grants to institutions and individual.

- Increasing the duration and size of grants.

- Maintaining current levels of formula funds and USDA agency support for research or extension.

- No change in the Joint Council and UAB structure nor in the overall planning process.

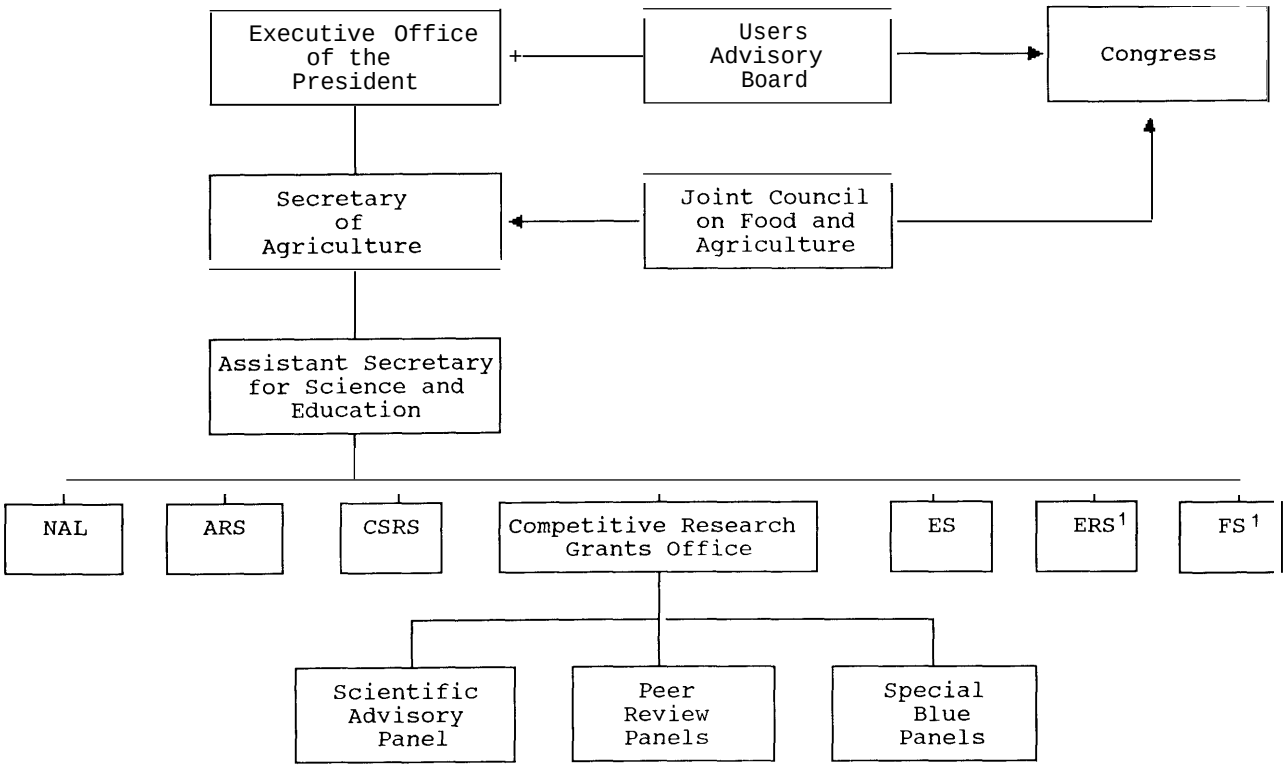
Competitive Grants Administrative Structure

The Competitive Grants Alternative recommends elevating the Competitive Research Grants Office from its current position in CSRS to agency status within USDA's Office of Science and Education. As such, it would have equal status with ARS, CSRS, ERS, FS, NAL and ES. Otherwise, the structure of USDA's science and education program would remain basically intact (figure 4-3).

Differences From National Research and Extension Policy Alternative

The Competitive Grants Alternative would not place as much emphasis on planning as the National Research and Extension Policy Alternative, which makes planning the driving force of the system. The driving force in the Competitive Grants Alternative is more money for research. Under the Competitive Grants Alternative, it is assumed that the major problem with the AR&E system is a lack of adequate

Figure 4-3-Organizational Structure for Competitive Grants Alternative



[1]ERS and FS would continue to report to separate and different assistant secretaries.

SOURCE: Office of Technology Assessment.

research funding, not structural problems in implementing a mission-oriented research and extension program as is assumed under the National Research and Extension Policy Alternative.

The Competitive Grants Alternative places virtually all of its emphasis upon research. One of its recommendations mentions technology and extension but only in terms of establishing a continuum from research to applications, not in terms of the development or delivery of extension programs. It maybe concluded that the Competitive Grants Alternative is a research proposal while the National Research and Extension Policy Alternative is a research and extension proposal.

Likely Consequences of the Competitive Grants Alternative

- Increased research funds would be available to all public and private universities (land-grant and non-land-grant) and government research agencies able to compete on a scientific basis. While formula fund support would not change, the role of competitive grants funding would be more comparable with what it is in NIH and NSE

- The rate of discovery and technological change in agricultural research would accelerate.
- Greater potential would exist for dealing with complex multidisciplinary problems.
- While funds would be available for strengthening grants, this proposal would inevitably lead to increased concentration of research talent However, this result may not be unique to this altemative. It has happened under the status quo and wouldprobably also happen under the research and extension policy alternative.
- The gap between basic and applied research could be reduced. However, neglect of extension education as a funding target would inevitably lead to a serious gap between research and extension.
- Nothing is done to improve the planning system and the linkage between planning and execution. There is nothing to assure that funds are allocated to UAB and Joint Council determined priorities.
- The drain of the best scientific talent away from extension would accelerate as more funds become available for research. And salaries would likely rise in research relative to extension. The best extension scientists would have strong incentives to seek experiment station appointments.