The food science area is a likely candidate for competitive research funds in the future.

Another way to look at the distribution of research funds within Cooperative State Research Service (CSRS) is by Research Program Group (RPG) (Table 4). Note the relationship of animal research to other RPGs. Most of the meat and muscle science research funds are within RPGs 4 and 8, Animals and Food Science, with smaller amounts in RPGs 3 and 5. It is questionable if the small increase in funding for most of the RPGs over the years has kept pace with inflation.

The source of funds at state agricultural experiment stations and cooperating institutions for three years is shown in Table 5. The total research funds have increased to over a billion dollars annually. Slightly less than one-third of these funds are from federal sources. CSRS appropriations account for about 18%, while all other USDA agencies account for less than 4% of total SAES research funds. More than half of the SAES research funds come from state appropriations. Industry input to these funds has been increasing and recently has been about equal to funds from product sales. Note that industry funds are greater than those from "other USDA" sources which include all USDA agencies except CSRS.

Funds from CSRS have increased on an average of 7% to 8% over each of the last 6 years.

Dr. Schwartz asked, "What is the difference, if any, between government and academic research?"

Attempting to describe the difference between academic and federal government research is analogous to trying to fight your way out of quicksand – the more you struggle, the further out of sight you go – downward. Essentially, there is little difference in the scientific research except for the influence of the source of funding. In the end, the final beneficiary is the public at large. Federal agricultural research is often described, not for what it often is, in fact, but in terms of what it perhaps should be relative to other agricultural research; that is – basic, high risk, generally long term, initially high cost/benefit, and potential pay-off is often long delayed. However, it is research that is considered necessary for advancement that other, smaller, less endowed organizations are not willing to undertake, without government undergirding, for these very same reasons.

This is not meant to imply that more directly applicable research is not considered by the government. Much of this type of research is done by agencies with research capabilities (for example, ARS) for another agency (like APHIS) without research capabilities in need of specific information that is not available. Federal government agricultural research often is conducted to fill a need that is not being fulfilled elsewhere.

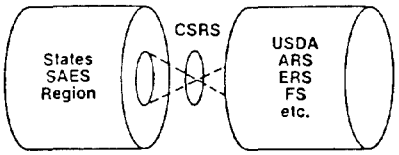
Table 5. National Inventory of Agriculture Research Funds at State Agricultural Experiment Stations and Other Cooperating Institutions

Source	*FY 1975*	*FY 1980*	*FY 1983**
Total funding (millions)	$499.4	$853.1	$1,096.7
	------ Percent of Total ------		
CSRS	18.4	19.1	18.7
Other USDA	2.2	3.2	3.5
Other Federal	7.1	8.4	8.7
Non-Federal Sources			
State Appropriations	57.0	53.5	52.5
Product Sales	7.5	6.5	6.0
Industry	4.8	5.7	6.1
Other	3.0	3.6	4.5

*Latest State Data available.

Source: Current Research Information System (CRIS), Table IV-B.)

THE PARTNERSHIP



Close coupling exists between state research programs and federal agencies. The principal focal point for the state-federal partnership is the Cooperative State Research Service (CSRS). CSRS is the federal agency that administers USDA funds appropriated by Congress for the State Agricultural Experiment Stations. CSRS acts as a lens focusing the broad programs of agricultural research in the states and facilitating communications and planning with other federal agencies.

Source: Research 1984. SAES, ESCOP, CSRS, p. 2.

Discussion

B. Moody: I'd like to address this question to Dr. Bray, and maybe some of the other members of the panel can comment on this. Bob, it seems to me that when I heard R.B. Sleeth's talk, his comments were that perhaps the universities need to be doing more basic research. I know we have a blend of that, both basic and what we call applied research. But, am I not correct in thinking that in our university system a few years ago we kept telling ourselves we had to do the type of research that had an immediate pay-off because the tax payers were expecting this sort of thing. Did we not get ourselves sort of in a bind in that respect? How do we get people to fund basic research, when they're not willing to wait for the results or they want them immediately? It seems to me that this thing is kind of in a tailspin.

R.W. Bray: I think you raised a good point. I think universities have to be engaged in basic research and I think they are becoming more heavily involved in basic research. I think it's a matter of identifying the source of funds that support basic research vs. the kind of research you're talking about. If we're talking with industry about funds, very obviously we have to

be doing research that is relatively short term that is going to produce results rather quickly so they can see the turnaround or they're not going to come back with more money. Industry at this point doesn't appreciate, in my opinion, the need to support long-term research. So I think we must depend upon grants. I think we're really headed in the right direction with competitive grants in the U.S.D.A. Steve has already pointed out that we're increasing the amount of money in competitive grants. Competitive grants are for the support of very basic research efforts, and that's needed. The biotechnology funds that have come along are also to support more basic research. I think that's all good and we need to do this, but when it gets down to industry support, I think we must be realists and appreciate that we must pause and use some of the basic knowledge we're accumulating and use it to solve shorter term problems and keep industry happy. In talking about industry, I'm talking about the livestock producer primarily, but also certain problems facing meat processors.

R.B. Sleeth: One of the reasons why there's not more basic research done in industry is because we have a tough time convincing some of our management, who may be short-lived in their position. They are judged on a year-to-year or six-month to six-month basis and they're interested in immediate pay-out in terms of the R&D dollars that they invest. But by the same token, they're also interested in grants to a university having immediate pay-out. While I don't agree generally, that's the fact of life in industry.

J. Regenstein: First, just a comment to Dr. Bray in terms of cooperative research efforts on some of the regional projects. At least some of them do involve industry people. We have fairly regular industry attendance and participation so I think that mechanism doesn't preclude it. They obviously can't get funding through that mechanism, but I think they can participate.

The main question I want to ask is directed to Dr. Sleeth. In your presentation, I think there's a dichotomy between some of these larger programs that we're seeing happening. You referred to the M.I.T. program where we're dealing in large bucks and large institutional structures, and I think they clearly have a place. In some ways, I think for some of us working with smaller dollar sums on a more one-to-one level, the problem of how industry perceives requests for funding for small projects exists. The whole problem of getting an industrial sabbatical has been brought up as a worthwhile endeavor, but in fact the industry does not seem to be as receptive as it might be to that approach because of their concerns for secrecy. Any thoughts on how to deal more on the lower level than these large program-area types of approach?

Sleeth: I mentioned those four or five items only as an example of what others are doing in hopes that it might trigger some programs that might be initiated by individuals representing various institutions. I realize that some of those might be far out, but as far as the M.I.T. program is concerned, I think it has worked extremely well. Any institution could put together a program comparable to that where they have gone after the industry dollars. They have really made that work very, very well. In terms of getting an academician on an industrial research staff, that can be very easily handled. As a matter of fact, we are in the throes now of considering having a faculty person from a major university join us for a year. We'll have the individual sign a non-disclosure agreement because in the past we've had some problems with proprietary information. This agreement indicates that anything observed or developed in our laboratory that doesn't result in publication will remain at the laboratory when he leaves.

B. Davis: I work at a veterinary laboratory and my time is divided between regulatory and research activities. I can see where a year's sabbatical would be quite beneficial on either side. How do you suggest I sell my administrator on the idea?

S. Zobrisky: There is a program in the U.S.D.A. called the I.P.A. program (International Personnel Act) which is made specifically to have this type of interchange. We have anywhere from 1 to 5 people practically every year in our agency who come in from the universities, and some of our scientists have gone out to the SAES system by way of the IPA Program. So, the enabling act is there. All you need to do is get a copy of it, present it to your administrator and sell him on the reason why you should go, how you'll benefit and how the organization will benefit. Our agency is quite compatible with this and yours might be.

N. Marriott: This question is for anyone that wants to tackle it, although it's more closely related to Bob's comments. At our university, in our food science department, we have recently embarked upon something a little different than we've done in the past in that I think we now have three adjunct professors from the industry. And since we are a small department, that is a significant percentage. This has just recently happened, and I'm not totally certain how we should draw upon the resources of these people since they are from industry and only have a limited amount of time to spend with us. So I would be interested in comments on how we might, now that we have this arrangement, more effectively tap the resources that we now have.

Bray: I think that's an excellent idea and I know that we have a few of those, in areas other than meat science at Wisconsin. Now, how do you draw upon them? I think you involve some of them in seminars, or as a joint advisor of a student. I think that surely would work. I think you involve them to the extent that they get familiar with your research program and some of the problems that you face in academia. I think too often they think that you hold forth in an ivory tower and you can get by with about anything. But, as all of us know, you can't! You in turn should seek some kind of a relationship with them so that you can be involved in their laboratories to the same extent. You need to get that exchange going. If you can get some exchange going between individuals in industry, academia or government, I think that will really enhance our cooperative relationship.

Sleeth: I'd like to add just one comment to that and certainly subscribe to what Bob says. I wholeheartedly support that idea. Many of you might recall that several years ago, I visited 15 to 20 universities on an annual basis, spending the day with them, talking with the faculty and graduate students. More recently, I haven't been able to do that, but I would certainly encourage all of you to take advantage of anyone in industry that would be willing to participate in such a program. I certainly would be pleased to serve in any capacity, spend a half-day or a day when I

happen to be passing through your area. I'm presently serving on an industry advisory committee at L.S.U. and I think that is particularly helpful to Auttis Mullins.

D. Simms: I have a question probably mostly directed to you, Dr. Sleeth, but the other panel members as well, perhaps. The emphasis seems to be in terms of funding basic types of research. The thrust is being pushed toward government either through funding at the university through government or directly through their own facilities. I have some trouble accepting or understanding how we can assume that's going to happen when the half-life of a politician is less and their requirements to justify their expenditures are no less severe than at the corporate level.

N. Cook: Dave's question is: How you can expect a politician to justify basic research any more strongly than someone involved in corporate research?

Zobrisky: In terms of the government, the half-life of a politician may be rather short, while the tenure of scientists is usually longer. There is opportunity for basic research in government. Government people at very high levels frequently point out that basic research should be done more extensively at the universities than at federal research centers. However, that basic research can be very expensive, and the pay-off way out in the future. This type of research should be conducted by the government because very few research institutions are endowed to conduct this long-term high-risk research unless they are accordingly supported. So the opportunity exists in the support institutions and in the federal research centers.

R.B. Sleeth: That's also where a lot of the equipment is located that can't be afforded by other folks, so that's a good place for R&D to be done. Industry should be financially concerned with process or product development.

Moody: I have a question for Steve. This maybe shows my ignorance as to how the funding is done, but I noticed that you said ARS appropriations were about 480 million dollars and CSRS was about 275 million, roughly half. How is that arrived at and what is the reason for the difference? Is that all political or is there some logic behind it? Or is that a fair question?

Zobrisky: It's a fair question but how can or should I answer it? I'll try. You see, ARS has in the neighborhood of 6,000 or more scientists and they do a lot of good research at institutions and centers all over the U.S. They also do considerable research for several government agencies that do not have a research capacity. ARS funds are not necessarily matched.

Most research funds go out from our agency to the SAES. In a sense, this is your own dollars being returned to you. These particular research funds must be matched at minimum dollar for dollar. As you have seen in Table 2, the state side puts in roughly 4 or 5 dollars for every dollar that comes from CSRS. We look at it as value well received. One research dollar is matched by 4 to 5. In ARS, this doesn't happen.

Cook: I'd like to make one comment before we adjourn this session. I'm speaking now from an industry viewpoint and in a situation where we as a company are involved presently in establishing some new products and some new procedures, I find that industry quite frequently has a definite fear of working with a regulatory agency and that this can present some problems on occasion. It's been my experience, mostly generated through working with FSIS at the Research Center, that this does not necessarily need to be a problem. This has been borne out in my latest activities at Rocco Further Processing. One place that we can look forward to generating some cooperation again with the U.S.D.A., (not necessarily on the cooperative state extension level, but perhaps on a more local level) is in the plants that you're working in, whether you are in industry or academic situations. You have to remember that those folks are in dire need of some place to do definitive research but don't normally ask to come into a plant to do work because of an obligation factor. This is one opportunity that is available to the industry.

Sleeth: If I'd had more time, I was tempted to put something in as far as what Nancy was talking about because back in the late 70's and early 80's, the food industry was spending almost 30% of their R&D dollars in response to governmental regulations. I think that has subsided substantially since then, to about 20% at the present time. Nancy's point certainly is well made that a lot of R&D dollars go toward keeping ourselves out of trouble with the regulators.

G. Schmidt: We really have to depend on the federal government for research dollars. Let's say I was successful in getting industry to give me $100,000, which is probably putting a vice-president's job on the line if they allot that kind of money, I think. The first thing the university says is that 40% or $40,000 of that goes to indirect costs. My job is also to train graduate students, so I put two Ph.D. students on this project and pay them $8,000 a year for half-time assistantship and the state wants another $4,000 per student for tuition, so that's $12,000 a year times two years is $24,000, times two students is $48,000. So I have spent $88,000 of that $100,000 already to do the work. If I'm doing this, I'm putting my job on the line for two years. I need to train these students, they need to publish journal articles. The funding that came from industry may not want that information published in every journal and for that I have $12,000 left to do the work. Is it worth it? And is this a realistic scenario? The question is open to anyone in the room. Dr. Bray certainly has seen this type of thing, and Dr. Sleeth would know whether it's worth $100,000 to industry to support this kind of activity.

Bob Bray: Well, that is really a tough scenario. I don't know how some institutions charge that kind of overhead on industry funds. I know our institution charges that on government agency funds, who obviously have more money, but I have never heard of 40% on industry funds. I've heard of negotiated overheads of 15% to 20%, which, I think, may be perhaps more realistic. Is it worth the trouble? Well, what would you be doing if you didn't have any funds? You must be a realist, you have to grow professionally and you have to have a good program, so I think that you will still probably seek out those funds even though you may become exasperated with institutions in terms of their getting the overhead funds. I know that we always were very concerned about that in our college because very rarely did we get any of those funds directly. However, we did recognize there was an institutional need and if the institution didn't get the funds that

way, they might suffer in other ways. I think it's still worth the effort to seek out those funds. When you're working with industry funds though, you have to be realistic in what kinds of projects you work on. You have to work on projects that are relatively short-term projects where the results are going to be coming in 2 or 3 years. The source of funds does determine the kind of research done. I'm convinced universities need to become more involved in long-term, mission-oriented basic research. You do have to seek funds other than from industry for that kind. And fortunately, I think, we're seeing a little bit of light at the end of the tunnel with the $20,000,000 that's coming into biotechnology in the USDA budget and in addition to that, the 4.5 million that is coming for animal and animal product research. You have to be a realist in this world and you have to put up with this type of funding until economic conditions are such that your state can support you better than they are now for more applied research.

Zobrisky: I don't question a bit that the input of this group and the other societies stimulated this money that we see now. In my written report, I have the comment that the next group in this competitive grant could be the food sciences. If it goes into special grants, your chances are greater. If it goes into competitive grants, it will be very basic work.

Cook: Steve, one comment I might have is that in my last association with the Meat Animal Research Center, the ARS blue book was actually, in fact, promoting some new funds for animal product development safety and those types of things. I don't know how far that's going to go, I'm not sure that ARS is very interested in doing that kind of research. I think that they're probably a little more interested in doing a little bit more growth-oriented, composition/type-oriented, and genetic-oriented research than they are the product development type. But I think that you can see some differences in the funding already occurring.

Zobrisky: I'll make a very short comment on product development. You've heard these two people. Bray and Sleeth talk about it. We, in general, in our shop are against product development as such. We are not against developing the principles involved, or the functionality of specific ingredients like proteins, fats, salt, phosphate, etc., in given situations but as far as developing the product, that is principally industry responsibility.

Sleeth: I want to respond also to Glenn's question as to whether it's worth it or not. I certainly think it is because, as I indicated in the presentation, we must train more graduate students to fill the voids created by many scientists who are retiring. But, if you were to come to me, Glenn, with a proposal for $100,000 and you had $40,000 of that going to overhead, you needn't waste your plane fare to come to Scottsdale. We've talked to other institutions as Bob points out, where there might be an overhead charge of 10% to 15% which would be certainly reasonable and acceptable, but 40% is out of the question. Maybe 40% overhead is a policy matter that ought to be handled in your institution. With respect to R&D, I think without question, as Steve just pointed out, most of the new product development ought to be performed in industry and probably 60% of our total activity goes in that direction. We are interested in more short-term than long-term research activities because we have management who is interested in immediate results. They are measured as far as their performance is concerned as to what they do today, not what's going to happen 5 to 10 years from now. So, unfortunately, while I don't agree with that posture and philosophy, that's the fact of life. That's the reason that industry looks toward government and academia for more of the longer-term research.

Zobrisky: I have a point on Schmidt's comment. In many of the institutions, the overhead appears to be negotiable. I've seen some considered to be very high, but if they know you're going to lose a sizable grant, they'll often come down on overhead.

J. Price: I'd like to make an observation, a comment and then a request. One observation relative to the title of the program, "Academic and Government Cooperation." It seems to me that there is one very serious thing that we've overlooked today. I think that there aren't many academic institutions that would exist if it weren't for their programs in training undergraduate students, which may be one of the most direct areas of cooperation and contact between academia and industry. I think we haven't made very many comments or directed much of our attention to that and I'm disappointed in that aspect.

The second thing is that we have listed here Cooperative State Research Service and there is cooperation between federal government and state governments on research. It seems to me, as a personal observation, that the way we have allowed grants and funds to flow, that we have encouraged and coordinated the idea of competition between individual researchers and competition even within agencies in the federal government. They're competing with one another, rather than developing a cooperative atmosphere.

The third point is that I was encouraged by Dr. Bray's comments, and I agree with him that there should be more exchange and sharing of individual scientists between academia and government, academia and industry. That is very close to my heart. I know that our Dean of Agriculture and Vice President of the university has very recently appointed a committee to try to work out a system where that can be done. I would like to request that perhaps, in our area of interest in meat science and animal science, AMSA could serve as a clearing house for the exchange and sharing of scientists. It seems to me to be one of the major barriers. Each individual who is ready to go on sabbatical or looking for sabbatical opportunities is left to his own devices or individual contact with cooperators. It might be that there could be someone within AMSA who could operate as a clearing house and see if there are opportunities. The same opportunity exists with government scientists and industry people who might want to spend six months or three months or a year in a different setting.

Question: What is the policy-making mechanism to determine which areas are going to be funded? Is there a possibility for industry people to set up some kind of foundation, set aside funds to help younger researchers in getting started?

Zobrisky: I believe the question is how do they really decide what they're going to fund? The information comes in from many, many sources. It comes up through the directors and E.S.C.O.P. (Experiment Station Committee on Policies) and on up through the Joint Council. That's a committee set

up by Congress. The user-advisory board is another broad band committee. There are certain other pressure points possibly on the congressmen, and then these inputs all come together, and the decisions are made. Now, for the precise line followed, I don't know it and I doubt if very many people really do in the end because some of these things come up rather quickly and some of them slowly through time. Most start at the grass roots with you, the scientists, in various societies and their priorities, the inner agency societies and their priorities, and your communications with your directors. Your directors carry these to the committee of directors, E.S.C.O.P., which represents four regions. The RPG's have priority committees that set up the priorities as they see them; these flow together, eventually a decision is made. In the end, I don't think you would want it otherwise, because it is not meant to serve one person, one institution, one state, but the whole United States.

Sleeth: Speaking from our own situation, our R&D dollars are generally committed to new product and new process development. If there is basic research that we're interested in, and we know that the university has the equipment and personnel, then I know other companies in the industry as well as ourselves are interested. As far as setting up a foundation to fund young scientists, I'm not sure what the mechanism might be. In the past we have had programs in our own organization where we have supported graduate students on an annual basis. With a change in management, we no longer have that program. Perhaps this is something that the association could do on the basis of other companies in the industry providing more graduate student support.