

SUBJECT: MWA Office Review and Approval of Project Plans for Peer Review (OSQR) (v. 10/12/06)

TO: Lead Scientists

THROUGH: Laboratory/Center Directors, Research Leaders

FROM: Steven Shafer, Director, Midwest Area

One of the major responsibilities of the Area Director's office is review and approval of draft project plans to be submitted for peer review from Midwest Area scientists to the Office of Scientific Quality Review (OSQR). This memo will provide you with information on the MWA Directors' approach to these reviews and the kinds of things we are most likely to address in any review comments you receive from us. I hope this information will be valuable to you as you begin to prepare your project plan for peer review.

By training, the Area Director, Associate Area Director, and Assistant Area Director have different backgrounds and areas of expertise. For example, I am a plant pathologist with supplemental background in soil science, and my own research in ARS focused on plant responses to pathogens and abiotic stresses. Thus, I will admit up front that I consider myself unqualified to comment in depth on experimental designs and procedures that most of you will describe for research in other fields of science. The other Directors may or may not have expertise directly applicable to review of the science in your plan. You should not anticipate many comments from us on the design and methods for conduct of experiments that we feel are outside our expertise. However, I spent five years (until January 2005) as a National Program Leader, and I saw a lot of prospectuses, project plans, peer review comments, and ARS responses, and I heard a number of post-review debriefings from the review panels. I have a sense of what constitutes a successful project plan in many aspects, and those impressions will fuel our reviews of all draft project plans that come into the MWA Office.

Of course, *before you begin writing the project plan outline (PPO) or project plan, make a thorough review of the instructions and guidance on the OSQR website.*

Here are aspects of your draft project plan that will get our close attention.

1. Format. This is the mundane part to review, but the plan has to conform exactly to the guidelines posted on the OSQR website. Don't deviate from them, please. That includes the page limits.
2. Basic information: Project title, National Program assignments, percentages of each SY's time on the project, and project objectives. NPS issues a PDRAM specifying all this. *The PDRAM should be considered the END of an in-depth dialog with NPS. Once the PDRAM is issued, there should be no reason to alter*

*the objectives.* If you disagree with the objectives in the PDRAM, or they surprise you for some reason, then a failure in communication has occurred, and it must be resolved immediately. The objectives in the PDRAM and your project plan must be identical, and if they are not, the MWA Office will ask you for documentation that says NPS approved of the change.

That being said, well-crafted *sub-objectives* can be very useful to elaborate work to be done under each objective, showing more creativity from the research team. Furthermore, this is a useful way to make adjustments in the plan as work progresses. A significant change in the PDRAM-driven objectives may require ad-hoc peer review of the changes. However, you may be able to adjust specific sub-objectives with no more than NPS concurrence. New sub-objectives may arise from considerations described later in the Contingencies section, for example. Make sure the sub-objectives make sense relative to their “parent” objective from the PDRAM.

Most plans have multiple objectives, so it’s useful if you provide a paragraph or two following the objectives that explain how they all are related. (In fact, if you don’t have a clear understanding of why all are in this project, contact your NPL.) It is very important that reviewers are not left with a sense that the objectives are unrelated. If an objective is there not because of the main thrust of your research but because of your expertise in a particular technology you are developing that could be applied to a different crop, this early statement of the objectives is the place to explain that. The thrust of your research may be different but when, later in the document, you describe work on this objective, the reviewers will understand why an apparent “outlier” is there.

3. Potential Benefits, Anticipated Products, and Customers. These are separate subsections under Need for Research, but they should be logically linked and consistent with the stated objectives. Considered together, these sections should tell a credible story that supports the ARS mission. In theory, all research in ARS should lead to benefits to producers and consumers of agricultural commodities, and many of you will want to claim these among your benefits and customers. The issue is how close are these customers to the actual work you propose? Some of us say that ARS does problem-solving research, others describe it in terms of research to enable decision-making, others may have a different spin, but the bottom line is that each research project should eventually lead to some public benefit in that general sense. You may be doing very basic molecular genetics or biochemistry, but that work should be motivated by a need to solve a problem or enable a decision, and you should be able to envision the entire path. Clearly, a single project is unlikely to be responsible for that whole path from the most basic, process-oriented research to delivery to a farmer. However, you should know how your work fits into that path, and you should have a good idea who else (ARS or otherwise) is going to be involved to complete the path to the field or consumer, and who will be the first party to pick up where you leave off. The more you think this through, the more credibility will reside in your claims of

benefits, products and customers. Whomever you claim your customers will be, you should briefly describe how they will get the immediate products of your work, how your outputs will be passed to them. For example, if you are doing genomics work that you claim will benefit producers of some crop, what is your vision to get your product into farmers' hands? Few farmers will read your scientific papers and figure out how to apply the data or results on their farm. Who are the intermediaries that must take your work to the next level? These intermediaries are the first customers of your work. What is your plan to make sure they pick it up, other than just publishing the work and hoping that they notice? While this may have little to do with the high scientific merit of your work, it is crucial to the mission of the agency that we have a realistic idea of how it will happen that the public will end up benefiting from their investment in our work. We will be looking closely at your description of the benefits, products, and customers, and credibility will be a big part of my consideration. Whomever you actually claim as a customer (scientist, engineer, industry, producer, consumer, etc.), we will want to believe that you know how they are going to obtain your outputs, whatever they are.

4. **Scientific Background.** The OSQR website clearly describes what should be here, namely, relevant literature, technology, and other ongoing research in ARS and elsewhere. Don't make it another statement justifying your work (that should have been done under Need for Research). Also, don't use up too much of your page limit and turn this into a comprehensive literature review; save the pages for detail on your experimental plans, which come later. The reviewers will want to know if you are on top of the latest developments in your field, but they will be most interested in the details of what you intend to do over the next five years. *It will be best if you think of this as a sort of gap analysis.* Focus on what is *missing* from the recent developments in your field; this should help lead the reader to what you will be doing to plug those gaps. In sum, this section should *support* the plan for research; it should not be a long centerpiece of the plan.
5. The section on the accomplishments from the previous project plan should not be exhaustive; rather, it should focus on major accomplishments and, most importantly, their impact. There should also be a brief indication of how the proposed research builds on past accomplishments (if applicable). This should be more than a listing of your prior plan. What the reviewers need to see here is what earlier research or research experiences you and your team have that demonstrates both why you are proposing to do this particular plan and why you are the best persons to do that. What specific achievements of an earlier project led to the milestones and plans of the present plan? What earlier work by you or your team demonstrates that you have the skills and abilities to perform the work proposed. The plan calls for up to 20 publications here for a researcher. These are to further underscore your expertise. This should not be an unselected list of publications but one that highlights the skills and background needed to accomplish the present work. You may wish to highlight significantly relevant prior accomplishments in

the background and provide further detail, including publications, in the prior accomplishments section.

6. Hypotheses. Most research in ARS is hypothesis-driven. Make sure these are credible, scientifically testable (i.e., falsifiable or rejectable) hypotheses related to the objectives. One of the most frequent comments OSQR receives from reviewers is that the plans do not contain real, testable, hypotheses. Some problems we have seen include:
  - Hypotheses that are too complex, i.e., these are statements with “and” and “or” that essentially make the hypothesis a compound hypothesis, rendering it very difficult if not impossible to really test and reject because part might be rejected and part might not.
  - Wiggle words. A hypothesis with “may” or “might” or “could” cannot be rejected; it’s true no matter what result you get.
  - Hypotheses about the researchers themselves. These say things like “Discovering the mechanism behind X will enable us to.....” This tests the abilities of the *researchers* to take information and do something with it. Instead, the hypothesis should focus on the experimental system itself.
  - Hypotheses that are statements of the obvious, or are scientifically trivial. “Disease results from expression of genes for virulence in the pathogen and genes for susceptibility in the host.”
  - Too global. “Quantifying X will provide significant increases in income for the industry.” I don’t know of any 5-year project plan in ARS that would be able to test this hypothesis.

Some research is not hypothesis-driven, and this is acceptable. Good examples are some types of engineering work and model development. Even in these, however, there may be a basis for hypothesis testing, e.g., testing whether a particular modification in a model provides a quantifiable improvement in how well the model predicts some real phenomenon. At any rate, peer reviewers look carefully at the hypotheses, and your credibility will be at stake if the hypotheses are not scientifically sensible or are poorly designed to address the stated objectives.

7. Contingencies. This is a frequently misunderstood section, and frankly, I think it has evolved since we started doing these project plans. The current OSQR guidelines instruct you to “Discuss approaches and experimental options that will be considered if the initial research plan is unsuccessful in evaluating hypotheses or attaining objectives.” This is definitely not a place to describe work you would do if you get new funding, either appropriated or grants. This project plan should describe what you will do over the next five years with the specific funds currently appropriated by Congress for the work. Contingencies should describe what will drive your choices of direction as you get results. Another way to think about this might be: What would make us decide to modify our sub-objectives?

A very good approach to Contingencies is to link the section *explicitly* with Milestones that you specify in the Milestones table that comes later in the Plan (see section 9 below). If you create good Milestones that serve as decision points along the way, then Contingencies are the decisions that come *as a result of* achieving those Milestones. For example, a good milestone may be completion of a particular experiment that provides important data in the general progress of the plan. You may not know exactly how that experiment is going to turn out (that's why they call it "research", right?), but getting those data is a key event. Once you have that data set, you know whether to choose one course of action and sequence of next experiments, or some other course of action. Approached this way, contingencies are the options you will choose among when a milestone is achieved. This is a very effective way to address both Milestones and Contingencies and shows the reviewers additional depth to your thinking.

8. Collaborations. Be specific about these people, and briefly describe a specific role for each. This can be done in your approach and procedures so that you can place them and their work in the context of your project. These will need to be backed up with letters from the collaborators, in which they describe what they will provide to the project. These letters should be more than generic statements of collaboration and that the ARS researchers are swell folks; they should state specifically what the collaborator will do in support of the project. I urge you to arrange for these letters as soon as possible because they are a required part of the project plan, and despite your colleagues' best intentions, many of your requests for these letters will be forgotten until the last minute.

There have been some rumors circulating that letters of collaborations are no longer needed. This is NOT true. If the action plan, PDRAM, or an approved cross-location document details a collaboration and identifies the collaborators, then no further documentation is needed (although reference to that document should be in your plan). For all other cases documentation in the form of a collaboration letter is needed if that person is integral to completion of some of the work on your plan (Obviously, if a person is listed on the signature page as an SY, a letter is not necessary). In the case of an SCA to accomplish some of the proposed work you need to state its existence, who it is with, and what they will be doing as part of the Approach and Procedures. Then append a copy of the SCA agreement in lieu of a letter. It is NOT acceptable to simply state that the SCA exists without explaining the what, why, or how.

9. Milestones. OSQR has a table format that you should use. We will be looking closely for specificity in terms of the achievement and the target date. As the project progresses, there should be no problem with a disinterested party determining whether a milestone has or has not been achieved in a timely fashion.

Examples (but not an exhaustive list) of good milestones that can be clearly achieved are things like the following. Anyone with knowledge of the research could tell whether they have been accomplished by the target date:

Complete a database on .....

Determine the accuracy and bounds of uncertainty of a model.....

Complete all work for a paper on.....

Complete the second year of a two-year experiment on.....

Complete the laboratory analyses for field samples collected last summer...

Deliver data from resistance trials to a breeder who will.....

Some milestones that are not useful:

Continue studies on... (cannot tell what threshold would determine success on this)

Develop understanding of... (understanding is a fleeting goal that can be overturned by new information tomorrow and is constantly being revised)

Plan a study that... (Planning is an ongoing activity for all scientists.)

Initiate experiment on... (could be as simple as a dated entry in a notebook)

Good milestones can be used to determine if progress is being made on achieving the objectives of the plan. Also, as described above in the section on Contingencies (see #7), linking Milestones and Contingencies can be an effective part of your planning process and reveals careful up-front thinking that will be appreciated by the reviewers. Once a given Milestone is achieved, you can choose among the options described in the Contingencies section. Explicit links between Milestones and Contingencies can be a very effective planning strategy.

We all know that occasionally a Milestone will not be achieved for one reason or another. A storm trashes the field plots, all the cultures die, a critical piece of equipment malfunctions, a collaborator doesn't follow through, a scientist leaves.....or, more happily, an unexpected significant discovery makes you want to make a change in direction or sub-objectives. Our system (and OSQR's Milestone Table) can make allowances for legitimate reasons preventing achievement of a milestone or creation of a new one. *Put serious thought into Milestones.*

10. Overall cohesiveness of the project. By this, I mean does the plan credibly describe a coherent, integrated project, or does it look "stovepiped" with respect to how the objectives and personnel interact? Some ARS project plans have been severely criticized by peer reviewers because the plans were structured so that Objective 1 is work to be done by one scientist, Objective 2 by someone else, etc. Regrettably, we have seen project plans that look like a description of work being done by scientists who just happen to have labs on the same hallway, or have the same job classification (e.g., microbiologist), or are combined just because there is a desire to have fewer CRISs in the Unit. It is important to describe a multi-personnel project in which the work hangs together into an integrated whole. Your plan should reflect how the work all comes together to accomplish the overall goals and objectives of the project.

11. Clearly provide information on project management. Since we do not provide budget information in these project plans, reviewers are often skeptical about whether we can actually accomplish all of our objectives.

Here is a good example of project management information. It is concise but clear about the team's capacity to perform the research.

Dr. Alpha will oversee soil C and N measurements, plant sampling and analyses, gas sampling, and data analyses. His GS-11 Postdoctoral Associate will devote 1.0 FTE to Sub-hypotheses 2b and 2d. His GS-9 Support Scientist, GS-9 Technician and two undergraduate students will devote 0.5, 0.3, and 0.5 FTEs, respectively, to Objective 2. Dr. Beta will conduct the intensive CO<sub>2</sub> flux measurements. A constant temperature room, infrared gas analyzer, automated colorimetric analyzer, CNS analyzer are all available in Dr. Alpha's lab or nearby labs to which we have access. A deep-core sampler is installed on a pickup truck and is available for use at the location. The rainfall simulator for measuring soil water infiltration, runoff and sediment transport has been built and is being calibrated by Drs. Alpha and Gamma.

It may be useful to put this management information with each Objective rather than at the end the plan. *Everything you can do to make it easier on the reviewer to understand what you will do increases the likelihood of getting a better rating.*

One comment about number of pages. Just because you have a certain page limit doesn't mean you have to fill all of them. Some of the very best plans have been those that come in well under the page limit. A tightly written plan reflects disciplined thinking about the work and will be recognized by the reviewers. If you find yourself struggling to get it all into the page limit, look first at your writing style and wordiness. Another good place to pick up space is a critical editing of the lit review down to a more focused gap analysis, as described above.

Definitely give the whole thing a careful review for typos, grammatical errors, and other mechanical mistakes that detract from the credibility of your presentation. Look at it critically for its overall logic and clarity, too. Having your plan criticized for its science would be enough of a disappointment. You don't want to be dealing with a "Major Revision Required" of good scientific plans just because your presentation was sloppy or poorly presented.

Before you send the draft plan to the Area Office, I strongly urge you to have it reviewed informally by one or more colleagues who really know the type of research you are proposing for the next five years. The best reviewers will be those who try to poke holes in your plan and the procedures you are choosing. They could be ARS colleagues, university collaborators, stakeholders, etc., but it might be most useful if they are experts who don't work with you directly every day, e.g., at other ARS locations. I know this takes time away from the window in which you have to write the plan, but I think it's time well spent. You can facilitate this by contacting desired reviewers ahead of time and asking if they can do a review within a couple days. This early, informal review is something I have neither the interest nor mechanism to enforce; I just urge you to get comment from critical thinkers before you submit your plan for formal peer review.

Your NPLs do not review the draft plan, and under our current procedures, you should not expect them to do so. Philosophically, I have no objection to you soliciting a critical review from anyone who is qualified, including the NPL. If s/he agrees to provide comments, consider it a favor, and I would appreciate knowing that your NPL is doing this for you.

Finally, the MWA Office's Program Analyst shepherds your project plan on behalf of the MWA through the lengthy peer review process. There are several deadlines along the way, and she will send out reminders now and then, and rattle your cage if we don't hear from you on time. It is very important for you to respond immediately to any contact you get from the Program Analyst. On the other hand, if you expect to be hearing from us about some aspect of project plan preparation, and you fear we have let you fall through the cracks, please do not hesitate to contact the Program Analyst or me to ask what's going on.

I hope this long memo will be useful to you and help you anticipate what sort of feedback I will provide on project plans submitted for review through OSQR. Feel free to contact me with questions or concerns.