

The 15<sup>th</sup> Committee for Experimental Plant Resource  
Evaluation and Suggestions

(April 4, 2016)

Experimental Plant Division

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◎: Compulsory report items ○: Major report items ●: Optional report items

◎ 1-1a. *Have sufficient results been achieved? (The BRC's standing in the world, contribution to society.)*

- From the following perspectives, it can be evaluated as meeting expectations:
  1. Vigorous efforts are being made to prepare *Arabidopsis thaliana* and *Brachypodium distachyon* resources, and the Center receives high ratings internationally on a par with resource centers in America and the United Kingdom. It means that RIKEN is rated highly in plant science at international conferences.
  2. A great contribution is being made to the plant research community by the preparation of a foundation for advanced research in plants and by the distribution of specimens. The fact that *Brachypodium distachyon* has been taken up as a model plant for the family of wheat, which is the major source of calories for the human race, and that preparation of an infrastructure for that research is proceeding smoothly, is commendable.
  3. Results are being produced as anticipated in the collection and quality control of resources. Consequently, contributions are being made to research paper publication and patent acquisition.
  4. It is highly commendable that specimens are being supplied at the highest level of quality in the world.
  5. Initially there were concerns about *Brachypodium distachyon*, but it is apparent that the accumulation of research and development of this plant as a resource has advanced.

6. The preparation of resources for functional analysis of *Arabidopsis thaliana* genes, as well as operations for their distribution, have expanded smoothly, and this has been rated highly. In future, heightened value will be sought in resources for the purpose of advancing research in *Arabidopsis thaliana* resources.
  7. Making contributions to society involves steady, step-by-step activity, and the unflagging efforts being made are commendable. It would be a good idea if collaboration with RIKEN public relations could be pursued in relation to these activities.
- The Committee points out and makes suggestions to produce sufficiently enhanced performance in the future:
    1. Personnel support appears to be inadequate in proportion to the magnitude of the research contribution being made. This appears to be due to budgetary circumstances, but it is certainly to be hoped that personnel support (staff increases) will be made.
    2. The deposition of specimens by individual researchers and the search for additional users are issues that affect the continued existence of these programs, so it is to be hoped that efforts will be continued, while observing trends in Japan and other countries. The time has come when the first generation of *Arabidopsis thaliana* researchers will be retiring, so actively approaching them to ask for depositions could contribute to the dissemination of research results that originate in Japan.
    3. It is to be hoped that resources will be prepared with various different strains and associated genome information attached wherever possible.
    4. Providing the fundamental plant science research community with *Brachypodium distachyon* as a model will probably be important in providing a foundation for future research on wheat and other such crops.
    5. It would be a good idea to present examples of possible applications of *Brachypodium distachyon* to crops.
    6. Considering the foundations that contribute to the agricultural crop field, and thinking about future directions, it seems advisable to consider collaborating with other institutions (especially the National

Agriculture and Food Research Organization (NARO) and other such institutions and universities) now more than ever.

© 1-1b. *Responses to previous comments and advice*

- From the following perspectives, it can be evaluated as adequately addressed:
  1. Matters are being addressed appropriately. As the provider of resources in demand from researchers, it would be advisable to continue collecting comments from researchers.
  2. Commendable efforts are being made to expand the number of users, for instance by organizing *Brachypodium distachyon* workshops, exchanging information on genome editing technology, and so on.
  3. Sincere efforts have been made in response to matters pointed out last time, and improvements are being made.

○ 1-2. *Is the self-analysis of strengths and weakness adequate?*

- From the following perspectives, it can be evaluated as adequately analyzed.
- The Committee offers the following suggestions to turn shortcomings into strengths:
  1. The Committee agrees on the statement that cites improvement of database convenience as a problem. Development of methods and technology for the analysis of imaging data information is slow by comparison with such developments for genome-related information. Collaboration with researchers in information science is necessary.
  2. The questions of what kind of imaging data and meta-information are considered necessary, and what methods are best for collecting those kinds of data, should be discussed thoroughly with researchers specialized in the area and steps taken so as not to fall behind international trends.
  3. The collection of ecologically variant strains determined by genome sequencing, the provision of added information such as phenotype analysis of gene-disrupting variants and metabolome analysis, the collection of multiple insertion mutants of gene families that have been published as research papers, and other such activities will be important.

4. As shown in the self-analysis, it is to be hoped that an approach will be taken in the direction of making it possible to identify information that is already stored in the database from a variety of different angles and make use of it.

© 1-3. *Is the plan reasonable for the medium to long term?*

- From the following perspectives, it can be evaluated as reasonable:
  1. Overall, the plan for the next five years appears good. In future, information analysis and information provision will probably become important fields in response to the needs of a society undergoing an information revolution.
  2. The Committee very much wants to give a boost to this project, which supports the promotion of basic research. For the project's long-term stability, however, it may be necessary to demonstrate effective collaboration with researchers, research institutes, and enterprises that aspire to implementation in society, or to implement other such schemes.
  3. At this point, it appears appropriate to have control both of approaches that have an eye on outcomes and those that are more oriented to basic research.
  4. Taking globalization and the era of the Trans-Pacific Partnership into account, collaboration between science and agriculture is important, and developments that are not possible at the individual crop plant level can be anticipated.
  5. The policy that calls for cultivating *Brachypodium distachyon* as a laboratory model for the grass family is acceptable. On the other hand, it is to be hoped that consideration will also be given to collaboration with researchers in agronomics and ecology and so on, and to preparation for specialized field promotion facilities.
  6. It is to be hoped that steps will be taken to prepare strains based on genome information for the purpose of research on biological activity in model plants.

© 2a. *Have appropriate fields been earmarked for future prioritization?*

- From the following perspectives, it can be evaluated as appropriate:

1. Attention is presently being focused on research that seeks to systematically analyze interactions between symbiotic bacteria and plants. Collaboration between laboratories within RIKEN is a strength for yielding results, and it is to be hoped that results will be forthcoming.
  2. The inauguration of a symbiosis research team in collaboration with the Microbe Division is timely and to be welcomed. It is to be hoped that closer collaboration will take place with related scientific societies and the research community.
  3. It is to be hoped that steps will be taken for the thorough development of key technologies using model plants and for advancement of biosystems research characterized by diversity and complexity.
  4. Having understood that this is a very basic field, it is judged to be appropriate.
- The Committee makes suggestions for further improvement as follows:
    1. Doesn't stress response differ by species according to genetic background? In future consideration of practical applications, it would appear necessary to present measures for linking the model to the crop.
    2. It is fine to pursue symbiosis in general, but it is probably better first to consider items that should be assigned particular priority.
    3. It is still necessary to analyze biological systems by transcription factor, and it should be possible to evolve further new approaches.
    4. It is not as though there are no preceding studies in the symbiosis field (microorganisms, plants, and insects) already. It is important to collaborate with researchers who have gone before.

© 3-2. *Are the policies for future resource infrastructure and technology development appropriate?*

- From the following perspectives, it can be evaluated as appropriate:
  1. This constitutes resource infrastructure and technology development that has versatility for the user.
  2. As a matter of technical policy, priority resources are indicated and administered appropriately.

3. It is to be hoped that the range of users will be broadened and that exploration will proceed while responding to feedback from users.
  4. It is apparent that efforts are being made to introduce genome editing and other such new technologies.
  5. It is to be hoped that efforts to collect diverse strains of *Brachypodium distachyon* will continue.
- The Committee makes suggestions for further improvement as follows:
    1. The importance of genome-related information and imaging data is expected to increase by comparison with raw plant resources.
    2. Technology development on the bacteria side for mycorrhizal fungus and other such symbiosis research may be necessary. It seems likely that host-induced gene silencing will also be necessary.
    3. Various research activities centered on genome information are expected to develop in the next decade, so there is urgent need to train researchers with stronger information capabilities.
    4. In order to collect new resources in a future context of budgetary and personnel constraints, it may become necessary to discard resources that are diminished in value. It would appear that consideration of such preservation guidelines is necessary.

### *3-3. Innovation hub*

#### ● *(i) Collaborations with industry, government, and academia*

- The Committee offers the following suggestions for further improvement.
  1. It would be advisable to make resources more visible to industry. With regard to collaboration between institutions, collaboration with research institutions of the Ministry of Agriculture, Forestry and Fisheries is advancing, and it would be a good idea to continue this.

#### ○ *(iii) Continuous operation and attracting new users*

- From the following perspectives, it can be evaluated as generally sufficient:
  1. It seems important for model plant researchers to disseminate information to crop researchers. For crop research, as well, including gene function analysis data with model plants will increase the grade of a journal.

2. Innovation is a difficult issue, and it necessitates having a pipeline in readiness and especially having a network of people already created.
  3. In order to broaden the range of users, it is important to collaborate with the National Agriculture and Food Research Organization (NARO) and other such organizations.
  4. At the same time, collaboration with universities is also important. RIKEN is well situated to serve as a hub for both parties.
- The Committee offers the following suggestions for further improvement:
    1. It is very much to be hoped that a website on experimental methods will be prepared.
    2. In order to be able to incorporate ideas in a bottom-up manner for new technology development, the possibility of issuing a public call for technology development may be worth considering.
    3. In order to increase the number of new users, it will be necessary not simply to provide information, but also to be ready to engage in analysis and other work together, such as through joint research.