COMMENTS AND DISCUSSION

Chaired by Tetsuo Matsumoto* and Osamu Ito†

Comment by Hirofumi Uchimiya‡:

I will just try to emphasize one of the major aspects that is quite important as a new tool and means in the development of a sustainable new technology for poverty alleviation. Many items have been discussed regarding how we can prevent poverty in rural communities as well as in the cities. Urban poverty is quite an important contributing factor in the expansion of the poverty level. Therefore, we may also need to integrate peri-urban agricultural technology. I will try to emphasize the aspect of biotechnology because this is quite a long-term project in many countries. The CGIAR has been very committed for many years. It has spent a substantial amount, probably about 10% of the total budget, or $30 million or so, on advanced technology for agriculture.

We have various agricultural backgrounds and many constraints. One important constraint is abiotic stress in the developing world. Abiotic stress is quite difficult to address. There are a number of abnormal environmental parameters such as drought, flood, freezing, high temperature, very intense light, nutrient imbalances, and other soil properties. How can we find good tools or strategies to overcome these constraints? This is quite difficult and must be tackled with great energy. If you are going from a temperate area to a tropical area, for example, the sustainability of plants in the new harsh environment is quite different. We must know the basic aspects of biology, physiology, and so on. We also have to worry about the quality of soil. In many areas of the world, the soil is toxic and contains aluminum or heavy metals. How can we get rid of these constraints, and how can we improve plant resistance to sustain productivity?

We also have a very big problem in rainfed areas. Most plants are very sensitive to anoxia or submergence in water. We have to understand the mechanism by which plants can tolerate and adapt to low oxygen concentrations. To find a solution to such a constraint, we have to have a very different approach. Even if you use the transgenic approach and manipulate a number of genes, transferring these genes to a single plant is quite difficult.

Now, thanks to the complete sequencing for the genomes of some plant species, we have a very good tool to understand the functions of the genome. The functional understanding of the genome tells us the complexity of genetic makeup and how the stress-related gene is coordinately working. Now that we have these different approaches, we will try to get all information together and apply it to solve the fundamental problems of agriculture.

Collaboration at the international level is quite important for doing this kind of task. Genome researchers are mostly information technologists. Wherever you are, you can access such valuable information. For instance, the CGIAR now has a very strong commitment in planning such capability as a catalyst to foster these contributions. We need to consider not just the poverty level for the developing country. We have to think about the quality of life, a condition that depends on the availability of enough food. We also have to consider safety in food quality, which can be sustained by education. Taken together, probably the new technology based on the genome-wide approach will give us a very good alternative.

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Yoshiaki Hayashi (Hiroshima University):

Biotechnology research has been progressing very well in many countries in recent times, but when we transfer the technology to the field, we usually have some difficulties with respect to the extension activities. Even when the extension work is done well, problems can arise. For example, consumers nowadays do not accept the genetic modification of vegetables. Therefore, I would like to ask Dr. Uchimiya how the researchers on the site should consider this.

Uchimiya:

You raised a very important question regarding consumer acceptance of GMO in developing countries. The situation in developing countries is entirely different from that in countries such as the US, Canada, and others that are consuming GMO foods. The issue is not really just the commodity. It is more an education issue. Public education is quite important. Also, we cannot actually force them to accept GMO. Even if you have a very excellent commodity, you cannot force them to use it. We must emphasize broader constraints like abiotic stress. It is not a single gene that imparts herbicide resistance and other similar types of qualities. This issue may be very difficult.

We also have to consider the strong debate among consumers, policymakers, and scientists. This debate is actually an ongoing issue. The Philippines, India, and many other countries have very strong public concern and very stringent policies on even the experiments on GMO plants. The situation is really different in developing countries, but we must provide more substantial evidence and try to take the opportunity, the scientific understanding and education, and the background of patent issues, and so on.

Comment by Toshiya Ikeda[§]:

One of the strategic themes for international collaborative research activities in the field of forestry is sustainable forest management, and it should be developed from various aspects. Dr. Appanah has spoken more on this theme, trying to link it to sustainable development. He has clearly outlined the weakness in the concept and problems associated with the contribution of forestry to the community, as well as various research needs. He emphasized that the participation of local people in forest management at various levels is very important for sustainable development. I totally agree with him. Therefore, let me make some comments on research needs in sustainable forest management, a field in which I believe multilateral cooperation will be requested.

One of the important criteria under sustainable forest management, most countries agree, is the conservation of biodiversity. However, this is the most difficult criterion to implement in forest practices in communities. In Japan, we have so far developed methods and technologies to monitor various groups of animals, insects, and plants and evaluate their population dynamics. We have so far prepared the products or goods to exhibit in the shopping windows, but each product and goods lacks a description of how it should be used. We researchers have to show which tools to use in which condition and for what types of objectives so that forest owners or users can buy our products. The market for those products seems to be larger because monitoring indicators on biodiversity become necessary for forest certification or for taking forest plants from a national level to some higher level. In order to obtain a common understanding about the scientific values of such technologies, it will be a matter of cost to strengthen the international linkage.

The next issue I would like to emphasize is the criterion for maintenance of forest contribution to the global carbon cycle. It has become very popular knowledge that forests work for greenhouse gas emission mitigation. In terms of observation of monitoring networks of carbon sequestration, we already have the domestic network and the ASEAN regional network. However, those are limited to carbon flux and not other

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rating parameters. Therefore, there is a need for international collaboration and linkages in this area, as well.

Under the Kyoto Protocol, Japan has to cut Greenhouse Gas emission by 6% between 1990 and the years 2008 to 2012, and 3.9% can be counted as carbon credit from forests with sustainable management, forestation and reforestation. So quantitative analysis and assumption of carbon pools consisting of aboveground biomass and below-ground biomass is a subject that needs to be urgently developed, particularly for Japan, even though the below-ground biomass is very hard to measure.

In addition to such difficulties, accurate monitoring of carbon stock changes at the national level is also very difficult. So we have to show the international evaluation team the science-based methodologies to monitor the changes of forest resources such as changes in area, changes in the rates of land, changes in carbon density and so forth. Research activities concerning those issues must be initiated not only at the national level in Japan, but also on the global level.

Finally, I would like to suggest that we may need international collaborative research systems to face and solve the risks on forest ecosystems as soon as possible, such as forest fires in the tropics or maybe in Siberia. The research systems are based on real-time information changes and research activities effectively utilizing internet and remote sensing technologies in the virtual laboratories built up by the researchers of member organizations. This is not a simple network, but a group of structures developed one step further. You may set up several key areas for long-term monitoring on changes of the forest ecosystem as well.

My institute, the Forestry and Forest Products Research Institute, has incorporated this COE project into the Japanese Ministry of Education and Science a couple of years ago, but we have not yet been successful in getting funding. I am sure we will need collaboration and support from JIRCAS before getting collaboration with foreign organizations.

Comment by Toshihiko Matsuzato**:

First of all, as an expert of fisheries, I would like to mention that we must establish a common language. The term 'fishery' is very easily affected by political views, so we need some more common terms like science and technology.

Second, we must realize the lack of any principal theory, especially in the aquaculture field. For example, some countries want to start some very modern high-density shrimp culture. Unfortunately, shrimp culture has not been very sustainable and can flourish only for three or four years. After four years, the productivity of shrimp ponds is drastically reduced. We hear that this is probably caused by disease. I am a fish pathologist and I can tell you that there is no real disease. The cultural conditions induce disease. I think we need principal theories in aquaculture. We are very lucky being in Asia, where we have a long history of aquaculture. But people hardly use scientists for their aquaculture. China has about 2,000 to 3,000 years of aquaculture history, and Thailand and Indonesia have histories of 200 to 300 years. We must therefore learn the traditional techniques from these countries. I think that would be the best way to establish a principal theory in the field of aquaculture.

John Caldwell (JIRCAS):

Most of our biological researchers are trained to study and create an understanding of science. Even our social scientists are trained to gather information and create understanding. So now there are two questions.

First, who can add these additional skills that our traditional researchers are not trained to have? They are not trained to produce or test institutional changes at the local level. They are not trained to design monitoring systems.

Second, what kinds of indicator performance measures, besides the traditional measures of contribution

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to science through publication, do both the scientists and research managers know how to use? What are some of the other types of performance measures that meet the challenges that you have laid out and will help people feel comfortable and able to do this?

Tyler:

In fact, there is quite a bit of expertise in participatory action research and some social sciences. There is an established body of literature and academic work, as well as lots of expertise in practice. The point here is that, if research is to be applied for development, what we are talking about here is applying research in practice. So researchers and practitioners, that is, extensionists, NGOs, community health workers, need to find ways to work together more. I think both sides can learn. The practitioners have a very good understanding of practical constraints to change in the field. Researchers have a good understanding of either specific technologies, specific technical packages, or, in the case of social sciences, theories and institutional and economic issues. Putting those two groups together is very productive for learning on both sides.

Now let me touch upon the question of incentives for research organizations. It is true—and I talk about this with academic colleagues all the time—that research as an enterprise (as an activity) is often rewarded through widely shared measures of output, that is, publication in high-status journals. On the other hand, development as an enterprise is recognized through impact and change. IDRC is a research organization whose objective is development. In fact, we have spent quite a bit of time and effort studying how to evaluate change. I would like to mention two kinds of tools and refer you back to our website where you can track down publications on both of these.

The first one is a programmatic tool that is useful for research managers. It is a planning and evaluation tool that we call outcome mapping. The point of this tool is to enable people who work in research (that is long-term change) to identify the actors, agencies, and institutions whose behavior they hope to affect through their work, and then to develop logical linkages through which those changes can be effected, monitored, and tracked over time. So that is outcome mapping.

The other one is participatory monitoring and evaluation. This relates to developing tools that are useful for local change and local adaptive management. We have developed and applied this technology at a series of projects in China where the local community developed indicators and monitoring systems for the research. It was not the researchers who monitored, it was not the external evaluators, it was the local target communities who actually monitored and evaluated the research project. The interesting thing about this was that it helped the communities learn more about how things change in their own communities. They learned something about the research as well, but it really gave the communities a much better understanding of change and power.

There is a book called 'Learning for change' and 'Participatory monitoring and evaluation.' I would refer that to you.