Breeding Science in the Genomics Era

Springtime signifies new growth and new beginnings after a long period of dormancy brought about by the cold and gloomy winter season. As we can see everywhere, the landscape around us is suddenly transformed into a colorful panorama with many species of the family **Magnoliaceae** in full bloom while the bees and other insects engage in the task of pollination under a warm sunshine. The fields are also transformed into a carpet of green as wheat and barley enter into heading stage producing young panicles. In some areas, rapeseed fields with blooming yellow flowers complement this scenery. Such landscapes are very familiar to all of us living in the Japanese archipelago. As we know quite well, most of the plants around us, whether grown in the fields for large scale production or as ornamental plants in public parks to satisfy the senses, have been generated in one way or another by natural or artificial breeding efforts over a long period of time. It is interesting to note how the science of plant breeding has shaped many aspects of our daily life especially regarding food, and how the economy and the environment has benefited from many breeding efforts.

Plant breeding is an endless undertaking as we must continuously increase crop production for an ever-growing world population and improve food quality to ensure a long and healthy life. However, a growing world energy demand amidst a continually shrinking oil supply is driving many countries to look for alternative fuel sources mainly from plants. The same plant products for food as well as sources of carbohydrates and oils are now being used for fuel to recycle CO$_2$ to compensate the increasing demand for energy sources, and to alleviate the adverse effects of global warming. In Japan however, as of 2007 less than 40% of energy from food supply is derived from sources produced domestically. About 20 years ago, although there was some success in breeding rice for silage, it was politically difficult to increase yield. The situation however has been reversed since then, and currently, with an annual per capita rice consumption of 60 kg, there is an overproduction even after the liberalization of the domestic rice market in 2004. This paradoxically means that breeding technology could now be used to address other issues that could lead to innovation of novel industries such as utilization of rice as potential sources of carbohydrates that can be used as biofuel. This strategy however could trigger a complex of factors affecting domestic and global politics, culture, or economic stability, and could also put the environment at risk. So we must strike a balance that would give equal priority to food stability while promoting the production and use of biofuels.

For the fiscal year 2008, the Ministry of Agriculture, Forestry and Fisheries (MAFF) launched a new big project with the aim of laying the foundation to resolve major issues on food shortage and global warming, and the challenges of developing potential sources of biofuels. This initiative is undoubtedly motivated by the decoding of the entire rice genome sequence in 2004 through an international collaboration led by Japan. The preceding Green Technology Project which aimed at efficient utilization of genome sequence information further produced invaluable results, which also became the driving force for this new project. This new initiative covers about 170 research themes ranging from basic areas of research such as developing new resources for crop production, isolation of agronomically useful genes and bioinformatics, to practical research areas such as improving the production of genetically modified and/or conventionally bred cereal crops, and application of bioremediation systems. The realization of each research goal is highly anticipated and would justify application of new breeding technology based on genomics.

An integral part of this initiative is public awareness and immediate access to information. Various researches in this project are expected to generate new results and output that would be of utmost importance not only to breeders but to researchers of other fields as well. The output from this project is therefore expected to reveal a wide range of information that can be used for further improvement of major crops in terms of productivity, biotic/abiotic stress tolerance, or seed quality to satisfy both farmers and consumers. We hope that **Breeding Science** will be used as a repository for all the output and information generated from these studies that could be used by breeders and the greater plant research community. In order to address this development, there has been a re-organization of the editorial board with the addition of new members from April 2008. The new editorial board now covers a wide range of expertise to facilitate more efficient review of submitted manuscripts and to accelerate turnover of papers for publication. The journal is now open to everybody who wishes to submit manuscripts on various areas of plant breeding and related fields. As we enter a new phase of breeding research based on genomics, we encourage the submission of high-quality papers in order to further establish **Breeding Science** as the primary source of the most recent information on crop improvement.

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