CROP GENETIC DIVERSITY IN MODERN PRODUCTION SYSTEMS: EFFICIENCY AND POLICY IMPLICATIONS

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The mini-symposium dealt with the economic policy implications of recent research in crop genetic diversity. A general belief exists that crop genetic resources are an important source of raw materials for crop improvement. However, at a broader policy level, governments and scientists may wonder why they should concern themselves with achieving genetic diversity, given potential trade-offs between its level and the goals of productivity and food security.

A rigorous framework for incorporating diversity issues into economic analysis has only recently begun to evolve. The mini-symposium focused on the utilization and productivity of diversity with specific emphasis on wheat production systems in China and Australia. There were presentations on the policy background for China by Jikun Huang (Chinese Academy of Agricultural Sciences) and for Australia by John Brennan (New South Wales Department of Agriculture). They examined past and current decisions in research priorities, funding for research and extension, market development and other government policies in the context of possible effects on diversity outcomes for wheat growing. The policy information provided the setting for presentation of applied work.

The selection of diversity measures was not specifically addressed, although the range of options and the importance of appropriate measures were recognized. In the applied work diversity indices adapted from ecological literature and representing various ways of measuring spatial diversity (for example, abundance, dominance and evenness of distribution) were calculated for China and Australia. Data used consisted of wheat variety pedigrees and morphological characteristics, as well as named varieties. The first application, presented by Melinda Smale (CIMMYT), estimated a system of reduced form equations for three concepts of spatial diversity – richness, abundance and evenness – at the shire level in New South Wales and at the province level in China. Explanatory variables included factors related to the supply of and demand for varieties, given physical features of the production environment.

The next two presentations examined the impact of diversity on total factor productivity (TFP) and production costs in seven major wheat-producing provinces in China during the period 1982–95. Diversity in both these studies was modelled as an endogenously determined variable. The study, presented by

Songqing Jin (University of California at Davis), also used diversity measures representing various spatial concepts in estimating a simultaneous, three-stage least squares (3SLS) system for the effect of diversity, technology and other explanatory variables (for example, infrastructure, institutional change and environmental factors) on productivity. Diversity was found to affect aggregate TFP positively in almost all of the specifications used. Although it is difficult to discern the exact nature of the link, the pattern of results suggests that diversity in terms both of named varieties and of morphological characteristics will contribute to an increase in TFP. This result implies that support for the use of diverse materials in breeding research will probably have positive effects on future productivity.

The cost function study used the Shannon-evenness measure of diversity based on morphological characteristic data. A five-equation system of spatial diversity, cost of production and cost share equations for fertilizer, pesticide and labour was estimated. Diversity was found to reduce significantly the cost shares for pesticide and labour, although its effect on total costs of production was positive.

The final session focused on policy implications from the empirical studies and addressed linkages between national level diversity outcomes and factors influencing diversity at less aggregated levels of analysis.