



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



About the Authors

Kelly Day-Rubenstein is an agricultural economist with the Economic Research Service, U.S. Department of Agriculture.

Melinda Smale is a research fellow in the Environment and Production Technology Division of the International Food Policy Research Institute and a senior economist with the International Plant Genetic Resources Institute (IPGRI).

Biotechnology and Genetic Resource Policies

What Is a Genebank Worth?

Brief 11

THE DEMAND FOR CROP GENETIC RESOURCES FROM A NATIONAL COLLECTION

Kelly Day-Rubenstein and Melinda Smale

Who uses a genebank? What kind of germplasm is requested and for what purpose? How is it in fact “used”? What problems do users identify? This case study seeks to answer these questions with data collected directly from individuals who requested samples from the U.S. National Plant Germplasm System during 1995–1999 for 10 major crops (barley, bean, cotton, maize, potato, rice, sorghum, soybean, squash, and wheat). Genebank accessions are used in many different ways, and large national genebanks receive many requests from international sources. In contrast to the perception that genebanks are rarely used, the findings reveal the sheer numbers of germplasm samples distributed by a large national genebank to many types of scientific institutions located in numerous countries around the world.

Like other national genebanks, the U.S. National Plant Germplasm System (NPGS) has a clear mandate to serve the needs of national scientists, and for the 10 crops studied, about three-quarters of the 621,238 samples shipped during the survey period were destined for requestors located in the United States. Nevertheless, of this number, 162,673 samples were sent to scientists located in 191 other countries and in 45 territories or commonwealth associations. Of these, 46 percent were destined for developing countries, 17 percent for transitional economies, and 37 percent for other, richer countries in Europe. The vast majority of all samples (77 percent) were sent to noncommercial organizations. Another 13 percent were sent to other genebanks, while only 5 percent and 6 percent were distributed to commercial companies and international agricultural-research centers, respectively.

The survey of requestors outside the United States, conducted by the International Plant Genetic Resource Institute (IPGRI), provides additional details on the kind of genetic resources demanded and their uses. Roughly half of all respondents requested improved cultivars, and an equal number requested either landraces or wild relatives—revealing a surprisingly high demand for exotic materials. On the other hand, the request for advanced materials and genetic stocks represented smaller shares. Demand for germplasm type depends on the crop, with landraces and wild relatives apparently more attractive to respondents working with potato, a crop with a very narrow genetic base. Genetic stocks with improved breeding lines were more likely to be requested by respondents working with maize, a crop with a relatively advanced level of basic research.

About 78 percent of the intended use of samples requested from the genebank was for breeding, prebreeding, and evaluation purposes to search for desired traits. Others were

intended for basic research or for adding to collection. The major focus for trait evaluation was biotic resistance or tolerance to abiotic stress. Respondents from developing countries requested landraces and wild relatives less frequently than did those from developed and transitional economies. Perhaps they sought materials that could be more immediately brought into their breeding programs, or perhaps, for traits such as resistance or grain quality, they tend to look first among their own locally adapted landraces.

Within the brief five-year period covered by the respondents, 11 percent of germplasm samples had already been incorporated into breeding programs (Table 1). Given the long time period required to breed a new variety, it is not surprising that much of the material is still being evaluated (43 percent). Respondents considered 19 percent of samples to be useful in other ways, leaving 28 percent of received materials described as “not useful.” The long-term nature of plant breeding and agricultural research, combined with the reproducible nature of seed, implies that the utilization rates calculated over a short period of time underestimate actual use patterns in both temporal and spatial terms. That is, materials may be useful much later in a breeding cycle than when they are first

received, and they may be incorporated into research multiple times by different users.

The percentages estimated from the survey data were applied to actual distribution data to estimate the utilization of germplasm samples sent to requestors outside the U.S. during the 1995–1999 period. In those years only, for 10 major crops alone, scientists in other countries have already used an estimated 17,686 samples in breeding or in other ways.

Notably, respondents located in developing countries reported a much higher share of samples—nearly 80 percent—to be useful in one way or another. They also reported a much higher rate of secondary transfers or sharing of samples with other scientists than did respondents in developed or transitional economies. A majority of these respondents also expected to increase their requests from the genebank during the next decade and were more likely to respond positively than those from either developed or transitional economies (Figure 1, next page).

In contrast to the perception that genebanks are seldom used, the data demonstrate in simple, unequivocal terms the volume of genetic resources distributed to scientists, redistributed to others, and used in various ways. Although maintaining public access to the

Table 1—Utilization of germplasm samples sent to other countries by the U.S. National Plant Germplasm System, 1995–1999

	Being used in breeding	Still being evaluated	Being used in other ways	Not used (not useful)
Estimated percentage of recipient			(percentages)	
Developed countries	6	41	29	25
Developing countries	18	55	8	20
Transitional countries	7	24	19	50
All recipients	11	43	19	28
Estimated number of samples			(counts)	
Developed countries	1,220	8,632	6,018	5,175
Developing countries	5,644	17,531	2,516	6,462
Transitional countries	733	2,473	1,984	5,168
All samples	6,794	27,299	11,777	17,686

Source: Survey conducted by International Plant Genetic Resources Institute.

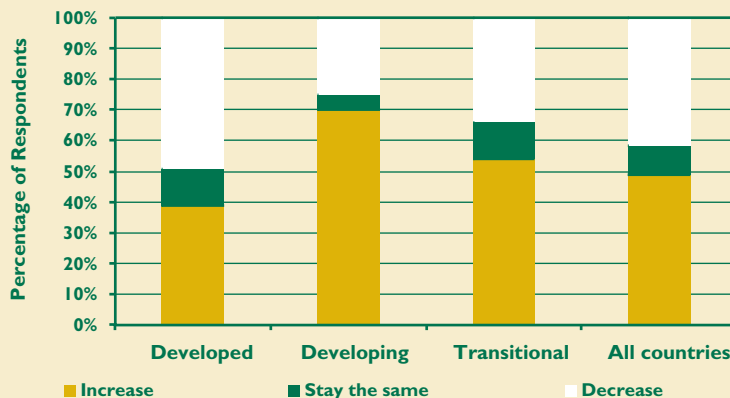
Note: Number of respondents is 380. Survey estimates are applied to actual distribution data provided by the U.S. National Plant Germplasm Resources Laboratory

resources housed in this large national genebank serves its national scientists, the international scientific community also benefits. Even national genebanks generate global benefits in use.

For more detailed information, see

Smale, M., and K. Day-Rubenstein. 2002. The demand for crop genetic resources: International use of the U.S. National Plant Germplasm System. *World Development* 30 (9): 1639–55.

FIGURE 1 Expectations for U.S. National Plant Germplasm System germplasm use over the next decade, by development status of country



For further information, please contact the series editors:
Melinda Smale (m.smale@cgiar.org) or Bonwoo Koo (b.koo@cgiar.org).

THIS WORK WAS MADE POSSIBLE IN PART BY SUPPORT FROM THE SWEDISH INTERNATIONAL DEVELOPMENT AGENCY (SIDA), SYSTEM-WIDE GENETIC RESOURCES PROGRAM OF THE CGIAR, EUROPEAN COMMISSION, AND THE U. S. AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID).

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K STREET, NW, WASHINGTON, DC 20006-1002 USA
TEL +1.202.862.5600 FAX +1.202.467.4439 EMAIL ifpri@cgiar.org WEB www.ifpri.org

Copyright © December 2003 International Food Policy Research Institute and the International Plant Genetic Resources Institute. All rights reserved. Sections of this material may be reproduced for personal and not-for-profit use without the express written permission of but with acknowledgment to IFPRI and IPGRI. To reproduce the material contained herein for profit or commercial use requires express written permission. To obtain permission, contact the Communications Division <ifpri-copyright@cgiar.org>.

Any opinions expressed herein are those of the author(s) and do not necessarily reflect those of IFPRI or IPGRI.