



Enhanced food and income security in South-west and Central Asia (SWCA) through potato varieties with improved tolerance to abiotic stress

International Potato Center CIP

Country/Region:	South, West and Central Asia (SWCA): Bangladesh, India, Tajikistan and Uzbekistan
German participation	Federal Research Center for Cultivated Plants- Julius Kühn- Institut (Institute of Resistance Research and Stress Tolerance)
Leading scientist:	Dr C. Carli
Duration:	Jan 2008 – Dec 2010

Initial situation

Potato is a highly nutritious staple and important cash crop for Central Asia, but productivity is low. Long dry spells, soil salinity and heat constitute major production constraints while expensive imported seed lacks adaptation to local conditions. In South West Asia (SWA), where potatoes are grown mainly as a cash crop, off-season production represents a good source of income for resource-poor farmers; but drought and high temperatures restrict the cultivation period thus limiting potential benefits to poor farmers.

Approach of the project

The project is essentially demand-driven and participatory. In a multidisciplinary collaboration between CIP scientists and stakeholders in Bangladesh, India, Tajiki-

stan and Uzbekistan, the project will build upon and exploit genetic stocks, molecular tools and research methods identifying the tolerance traits that farmers need. Moreover, the focus is on facilitating strategic exchange and testing of advanced breeding products. Multilocation trial data will be recorded using integrated geographic information systems (GIS) and statistical analysis to help identify varieties with specific or broad adaptation.



Major results achieved

We found several traits that allow the plant to survive and produce under water stress conditions. The most important ones are:

- improved water use efficiency,
- enhanced root growth under drought,
- increased capacity for plant regeneration after wilting, and
- greater harvest index.

The physiological basis of these traits consist of balanced control of stomatal conductance, osmotic adjust-

ment in form of solute accumulation in plant cells resulting in lower osmotic potential, and maintained turgor under water stress. Candidate genes involved with the expression of these traits have been identified. Trials implemented in SWCA confirmed these hypotheses.



Expected impact

At least 200,000 farm families will benefit from abiotic stress tolerant varieties that will boost production and reduce risks of crop loss. National Agricultural Research Systems (NARS) will have the materials and tools to speed up the breeding process. Producers will harvest more reliable and larger quantities of marketable potatoes, while consumers will enjoy stable food prices. The geo-referenced risk maps and growth models validated by the project will be available to researchers, regional governments, extension services and policy makers for vulnerability analysis and decision support.

Specific outputs include:

- Improved access of smallholder farmers to new, early maturing potato varieties adapted to stress-

prone environments;

- Plant growth models, screening methods and marker systems for key traits of abiotic stress tolerance adapted and applied for stress tolerance breeding;
- Dynamic maps and models depicting and characterizing stress-prone agroecologies at present and under future climate change scenarios available to NARS, regional governments and extension services;
- Stress tolerance traits and genes identified and combined in new biodiverse parental material;
- Quality seed of biotic stress tolerant and early bulking varieties for diversified cropping systems produced and disseminated to farmers.

Collaborating institutions

Institute for Plant Physiology & Genetics, Dushanbe, Tajikistan; Bioorganic Chemistry Institute of the National University of Uzbekistan, Academy of Sciences, and Institute for Vegetables, Melon and Potato, Tashkent, Uzbekistan; Tuber Crops Research Institute (TCRI), Bangladesh; Central Potato Research Institute (CPRI), Shimla, India.

The Advisory Service on Agricultural Research for Development (BEAF) manages Germany's contribution to international agricultural research. Instruments for implementation are project funding, postdoc funding, small grants and liaising between German and international researchers. BEAF is part of GTZ and acts on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ).

Imprint

Published by:
Deutsche Gesellschaft für technische
Zusammenarbeit (GTZ) GmbH
Advisory Service on Agricultural Research
for Development (BEAF)

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-3347
F +49 61 96 79-803347
E beaf@gtz.de
I www.gtz.de/agricultural-research

Dahlmannstr. 4
53113 Bonn
T +49 228 24934 231
F +49 228 24934 215
E judith.jansen@gtz.de

Pictures by:
International Potato Center CIP

Contact:
Dr Carlo Carli: c.carli@cgiar.org



November 2009