

Project 5: Strengthening National Seed Systems in Dry Areas

Rationale

'Seed systems' and 'seeds' are often used interchangeably with misleading connotations and imprecise interpretation. 'Seed systems' are not limited to the physical production of seed production; the term refers to a broader concept of technological, institutional, regulatory and policy frameworks for mobilizing and organizing the physical, financial and human resources within the variety development and seed production, delivery and use continuum operating at national, regional or global levels.

National seed industries operate under heterogeneous environments in terms of their agro-ecology, farming systems, crops and markets in developing countries. They face a range of problems, including ineffective policies, regulatory and institutional frameworks, deficiencies in production and processing facilities and limited technical and managerial capacities. Formal public seed enterprises predominate, yet they lack market orientation and the skills necessary to operate as profitable enterprises. A competitive private seed sector is absent in most developing countries and, if it does exist, lacks incentives to invest in less profitable self-pollinated crops and in risky dry areas where the formal sector (public or private) supplies only a small portion of the seed of major crops; the remainder is provided from farmers' own stocks or exchange among farmers – the informal sector. Formal seed sectors are often disrupted in post-conflict countries, presenting a major constraint to rebuilding agricultural productive capacity.

Seed is a critical input for agriculture and is a key pathway to delivering agricultural innovations to farmers. The inherent weaknesses in seed delivery pathways limit farmers' access to improved varieties and seeds thus limiting the impact of agricultural research. Research addressing seed system constraints will improve the delivery of improved varieties and seeds thereby contributing to improving agricultural productivity, ensuring food security and improving the livelihoods of the rural poor.

Given the strong interface between crop improvement and seed supply within the research-for-development continuum, ICARDA has long recognized the inherent weaknesses in the seed sector particularly in the dry areas and established a Seed Unit with a clear mandate to provide the research base for strengthening national seed systems. The Seed Unit is involved in a diverse and broad range of activities that collectively address seed system constraints. It is working in an integrated holistic approach with a broad range of partners at national, regional and international levels. ICARDA's work on seed systems has evolved over time with shifting research emphasis on emerging national, regional and global issues in seed industry development. Within this broader context of strengthening the national seed systems, the Seed Unit will continue to be involved in key areas of seed system research and development supporting both the formal and informal seed sectors.

The research agenda in this MTP is to generate IPGs addressing seed system constraints and providing alternative solutions. The research addresses System Priorities 2 (maintaining and enhancing yields and yield potential of food staples), 5A (research on institutional organization and management of public agencies), and 5C (research on rural institutions, specifically community-based seed production enterprises). The research agenda was included within MegaProject 6 (Knowledge Management and Dissemination) in the MTP 2007-09; it has now been realigned within the biodiversity and integrated gene management program following EPMR recommendations in 2006.

Outputs

The project goal, purpose, outputs, output targets and associated expected outcomes and impacts are provided in the attached Project Logframe. Where an Output Target contributes to a Challenge Program or a Systemwide/Ecoregional Program, this is indicated in the Project Logframe. Below, we describe for each Output: (a) the relation to system priority goals, (b) the impact pathway, (c) the research approach to developing international public goods (IPG), and (d) the role of partner organizations.

Output 1: Strengthened seed systems through increased private sector participation and alternative delivery systems

2.5 Relation to SP goals

Any crop improvement hinges on an effective seed delivery system. Output 1 meets specific goals of SP 2A, 2B and 2D through critical analysis of constraints of seed delivery pathways and designing alternative pro-poor seed supply and its sustainability. It also contributes to SP 5A through rationalization and harmonization of regulatory/policy frameworks to ensure the participation of the private sector and SP 5C by organizing farmer groups and/or communities to be engaged in seed delivery through village-based seed enterprises (VBSEs).

2.6 Description of Impact Pathways

The efficiency and effectiveness of a seed system's performance hinges on making available quality seeds to farming communities within the research-seed supply-use continuum. Modern crop varieties are defined outputs of collaborative research with NARS and one of the key pathways for delivering the technology and realizing the impacts of investment in agricultural research. Availability and access to seed of modern varieties is critical in increasing agricultural production and productivity and thus in contributing to reduction of poverty and improving rural livelihoods. This is particularly relevant for the majority of small-scale resource poor farmers in the dry areas who are entirely dependent on agriculture. Research to strengthen the seed systems addresses one of the key constraints in technology delivery by enhancing the efficiency of the formal sector and encouraging private sector participation and improving the performance of the informal sector by exploring innovative delivery systems such as VBSEs.

At present, neither the public nor the private formal seed sector in many countries has an effective strategy of seed provision for most small-scale resource poor farmers in less favorable and marginal dry areas. An innovative and cost effective way of delivering seed from both conventional and participatory breeding approaches is to decentralize seed production through the participation of farmers. The VBSE schemes multiply locally adapted and preferred varieties at a lower cost, making it more affordable to farmers, by adopting appropriate standards and equipment. The availability and use of quality seed of improved varieties will ultimately increase production, in turn contributing to food security and farm incomes. ICARDA is pilot testing the concept of VBSEs and plays facilitating and catalytic roles by creating functional linkages among different stakeholders including agricultural research centers, the formal and informal sectors, ministries of agriculture, development organizations, NGOs and farmers for the sourcing of improved material, the testing and release of material, the provision of source seed, seed quality assurance services, capacity building, etc. ICARDA also plays a role in stimulating discussions on creating enabling regulatory and policy environments for the sustainability of such alternative seed delivery systems.

Many governments are also liberalizing their economy to stimulate economic growth and development. These policy shifts have brought many challenges and opportunities in the seed industry, particularly encouraging private sector participation by reforming and harmonizing policy and regulatory frameworks, harmonization initiatives and formation of regional associations to create an enabling environment to attract domestic and/or foreign investments and stimulate regional seed markets. It is assumed that a nationally reformed and regionally harmonized seed policy and regulatory framework would create an enabling environment for the development of pluralistic and competitive seed industries. Such efforts will create a mix of government organizations, foreign and domestic private companies, small seed enterprises, cooperatives, farmers associations, NGOs, and individual producers involved in seed production meeting the diverse need of farmers.

2.7 Research Approach to Develop International Public Goods

National seed industries face several policies, regulatory, technical, institutional and organizational constraints which hamper their effective performance. ICARDA works with partners in comparative analysis of national seed policy, regulatory and institutional issues that hinder performance at a country level and/or rationalization and harmonization of the same issues for integration at regional levels. The analysis will broaden our understanding of the constraints and to propose changes in policy and regulatory frameworks that leads to desired impacts in seed delivery system. The model policies and regulatory frameworks developed at national and/or regional levels are IPGs that can be adapted to countries with similar set of conditions and/or regions with interest in regional integration.

The research on alternative seed delivery through VBSEs targets farmers in less favorable environments and remote areas and builds upon existing local institutions, knowledge, skills and experience of farming

communities. It focuses on mobilizing farmers to engage in producing and marketing quality seed within their community and beyond. The research focuses on financial viability and sustainability of VBSEs as alternatives for formal sector institutions to ensure seed delivery to resource poor farmers. The concept of VBSEs is in itself an IPG that could be replicated by up-scaling and out-scaling in other locations or countries with similar socioeconomic, regulatory and policy environments and where a gap exists in seed demand and supply.

Rangelands occupy the highest proportioning of dry areas. Native shrubs and grasses are important components for rehabilitation. However, there is limited knowledge on seed quality issues in rangeland species and techniques for rangeland rehabilitation. Research on seed quality and seed bank dynamics in range species would generate IPGs for seed quality management and rangeland rehabilitation options.

2.8 Partners' Roles

The project involves collaboration with a broad range of stakeholders in seed industry development. This includes Ministries of Agriculture, NARS, public and private seed sectors, national and international development agencies, international seed organizations (ISTA, ISF, UPOV, etc), NGOs and other IARCs. The policy and regulatory reforms and harmonization and the establishment of VBSEs require multi-stakeholders consultations and processes to build a consensus at community, local, national, regional and international levels to achieve the desired goals and impacts.

The partnership for policy and regulatory reforms include the private sector and their associations (national, regional and international), government policy and regulatory agencies, NARS, national seed programs, regional and international organizations in agricultural research and seed sector development, and inter-governmental organizations fostering regional economic integration. The private sector through its collective voice would lobby governments for creating an enabling business environment to facilitate commercialization of seeds and their operations at national and regional levels. The regional organizations would support policy and regulatory changes that addresses barriers for seed trade and fostering integration among member countries.

The establishment of VBSEs alone would not guarantee success unless they are linked to formal sector institutions such as the Ministry of Agriculture, development agencies, extension services, agricultural research, and financial institutions which provide technical and material support. ICARDA's partners in this effort are other IARCs, the participating NARS, the private sector and NGOs. ICARDA will be responsible for the initiative in accounting to the donors, and provide an overall leadership and technical backstopping. It will initiate the production of seed stocks of improved varieties it has generated through research with NARS, and spearhead the linkage between the local seed enterprises and the formal sectors, experienced seed producer associations elsewhere, the network of seed traders and private manufacturers of seed equipments. The sister CG and advanced research centers will make their modern varieties that are adapted to the ecologies available for use by local institutions and participating farmers. NGOs will contribute to the identification, facilitation and mobilization of communities and farmers to form seed enterprises and seed producer associations and at the same time appropriation of the village-based concept of enterprise development for replicating and scaling out to other locations. The NARS research institutions will ensure linkages with on-going research programs and projects.

In Afghanistan, the VBSE programs will be implemented in partnership with the Ministry of Agriculture and Irrigation and CG partners (CIP, CIMMYT) and supported by USAID. In Pakistan the Arid Zone Research Center and Agricultural Research Institute and the Ministry of Agriculture and Livestock and in Eritrea the National Agricultural Research institute and the Ministry of Agriculture are implementing partners. ICARDA provides technical support while the national partners are implementing the program. The partners will be responsible for ensuring that VBSEs are organized at community level and become operationally sustainable.

Harmonization will be implemented with respective national seed programs (Ministries of Agriculture, NARS) including public and private seed sector stakeholders (e.g. ECO member countries). The role of ICARDA is to review the regulatory framework based on the information provided by national partners. The role of the national partners is to organize and participate in national and regional consultation meetings to discuss and adopt common and harmonized regulations.

The WANA Seed Network, apart from being an information network will consolidate into a biennial international seed conference and regional seed association through public and private sector partnership. ICARDA will play a catalytic role whereas the public and the private sector of respective countries in the region will organize the conference and establish the association. The national seed associations (e.g. Turkish Seed Industry Association), regional seed associations (e.g. Central Asia Seed

Association) and national seed councils (e.g. Egypt) are some of the key national partners in this endeavor.

The research on seed quality management, seed bank dynamics and alternative seed systems will be conducted with national partners in Syria and Iran through post-graduate studies in collaboration with Aleppo University (Syria) and Wageningen University and Research Center (The Netherlands). In Syria the main partners are the General Organization for Seed Multiplication and Steppe Directorate of the Ministry of Agriculture and Agrarian Reform. In Iran the main partner is a Seed and Plant Certification and Registration Institute.

Output 2: Enhanced capacity of national agricultural research, seed programs, development agencies and extension services to better manage seed supply system

2.1 Relation to SP Goals

Output 2 meets specific goals of SP 2A by strengthening the NARS capacity within the variety development-seed production-use continuum and SP 5C through farming communities engaged in local seed production and supply including key stakeholders in the implementation of VBSEs.

2.2 Description of Impact Pathways

The workshops on seed industry development and related issues are part of policy advocacy to create awareness among policy makers, senior seed program managers, and other stakeholders. The seed courses are primarily targeted at technical managers and subject matter specialists to enable them to operate effective and efficient seed delivery systems. The regional seed network also plays a crucial role in information sharing and dissemination.

2.3 Research Approach to Develop International Public Goods

Conducting the training programs and developing training manuals, e-learning and web-based training resources, will upgrade NARS capacity for testing and adapting the IPGs derived from the expert systems and other knowledge sources. The knowledge generated through this training is made available to other stakeholders

2.4 Partners' Roles

The training courses and workshops are organized in collaboration with the national seed programs that will provide logistic and material support particularly at the country level. The third country training program is implemented with Syrian State Planning Commission through financial support of the Japan International Cooperation Agency (JICA). The General Organization for Seed Multiplication in Syria and the Ministry of Agriculture and Irrigation (MAI) in Afghanistan are national partners who are responsible for selecting the participants for the training courses and regional workshops. The workshops benefit from resource persons from the national seed programs of Egypt, Morocco, Pakistan, Turkey and others with advanced seed programs in the region. The international seed organizations such as ISF, ISTA, UPOV, etc are contributing as resource persons to various workshops and training courses organized in seed sector development.

Output 3: Seed of promising improved varieties of barley, wheat, food and feed legumes available to national seed programs

3.1 Relation to SP Goals

Output 3 meets specific goals of SP 2A, 2B and 2D by strengthening the NARS capacity within the variety development-seed production-use continuum and enhancing the availability, access and use of improved varieties to realize the impacts of agricultural research at the farmer's level.

3.2 Description of Impact Pathways

Lack of effective organization and management of variety maintenance and breeder seed production remain a major constraint in many developing countries. It is organized on ad hoc basis without any clear responsibility for the public breeding institutions or the public seed agencies. Public plant breeders may soon lose interest once a variety is officially released in the absence of any incentive system. NARS in dry areas have limited capacity and no in-built mechanism for pre-release seed multiplication, creating a time lag between the release of the variety and availability of seed for commercial production. Moreover,

the emerging national private sector may not have full access to public-bred varieties because of lack of policy support.

Availability of and access to early generation seed (breeder seed) supply to NARS and national seed programs will accelerate seed multiplication there by ensuring the adoption and diffusion of new crop varieties emerging from a partnership breeding program of IARCs and NARS. Strengthening the variety maintenance and breeder seed production in terms of infrastructure, capacity building in human resources will impact on certified seed production by the national seed programs and availability and use of certified seed by farmers in increasing agricultural production and farm incomes.

3.3 *Research Approach to Develop International Public Goods*

Improved crop varieties developed through partnership with NARS are international public goods ready to use by public and private sector or farmers. Developing a mechanism to strengthen the system of variety maintenance and delivery system will enable to realize the impact of public investment in crop improvement. Designing effective mechanisms requires comparative analysis of different options for early generation seed delivery (e.g. commercialization of foundation seed production)

3.4 *Partners' Roles*

ICARDA Seed Unit collaborates with NARS breeder seed units (if they exist) and national seed programs in implementing the activities. The breeder seed units would be involved in developing mechanisms of maintaining and multiplying the seed of new varieties and making them available to the public and/or private seed companies that would initiate further multiplication to produce and market certified seed to farming communities.

Project 5	Strengthening National Seed Systems in the Dry Areas
Goal	Increased productivity and sustainable food security through improved availability and access to adapted varieties and quality seeds in the dry areas
Purpose	Strengthened capacity of formal and informal seed systems in dry areas to supply farming communities with quality seed of well-adapted varieties in a cost effective and sustainable manner

Output Targets		Intended Users	Outcomes	Impact
Output 1: Strengthened seed systems through increased private sector participation and alternative delivery systems		Seed industry participants, i.e. formal (private and public seed company) and informal (farmers' groups, NGOs), seed producers, distributors, and other organizations in the dry areas.	Quality seeds of diversified and improved crops and varieties made available to farming communities, local technology transfers agents and NARS	Sustainable improvement in the income and living conditions of farmers through increased and stable crop yields.
2008	Document on harmonization of seed regulations prepared for ECO member countries	Policy makers, legislative bodies in ECO member countries	Private seed sector able to produce and market improved seed in the sub-region.	Farmers have access to quality seed, resulting in better yield, yield stability and incomes.
	Regional Seed Network operating as information network, biennial international seed conference and a regional seed association	Public and private seed sector stakeholders in non-tropical dry areas	Better cooperation and integration of the seed industries of non-tropical dry areas	Farmers have access to quality seed, resulting in better yield, yield stability and incomes
2009	Village-based seed enterprises (VBSEs) established in selected countries	Farmers/ farming groups	Better availability of improved seed	Better yield, yield stability and farm income
	Seed bank dynamics in degraded rangelands documented and disseminated	NARS, rangeland communities	Communities use methodologies for rangeland rehabilitation	Better use of rangelands and livestock productivity
	Wheat seed supply systems in Iran documented and disseminated	NARS, wheat producers	Better supply of wheat seeds	Increased production and productivity of wheat crop
2010	VBSE experiences across countries documented and published and VBSEs institutionalized as alternative seed supply system	Policy makers, national seed programs, development agencies, NGOs	Better knowledge in functioning and performance of VBSEs	Effective mechanism for seed supply in less favorable environments and less accessible areas
	Impact of VBSEs on seed supply studied in one target country	Policy makers, national seed programs, development agencies, NGOs	Better knowledge in functioning and performance of VBSEs	Effective mechanism for seed supply in less favorable environments and less accessible areas
	Provincial level associations of VBSEs operational in Afghanistan	VBSE member farmers and partners	Stronger advocacy role in the national seed supply	Enhanced performance of the national seed system

Output Targets		Intended Users	Outcomes	Impact
Output 2: Enhanced capacity of national agricultural research, seed systems, development agencies and extension services to better manage seed supply systems		National research and extension systems; national seed industry staff; universities.	More effective knowledge-based national research, seed and extension programs	Enhanced performance of R&D endeavors.
2008	One regional workshop and three courses organized in seed industry development aspects training over 100 NARS and seed staff and farmers	NARS, national seed programs and technology transfer staff and farmers/farming groups	Better performance of national seed sector for delivery of quality seeds	Better productivity, yield stability and farm incomes through use of quality seed
2009	One regional workshop and three courses organized in seed industry development aspects training over 100 NARS and seed staff and farmers	NARS, national seed programs and technology transfer staff and farmers/farming groups	Better performance of national seed sector for delivery of quality seeds	Better productivity, yield stability and farm incomes through use of quality seed
2010	One regional workshop and three courses organized in seed industry development aspects training over 100 NARS and seed staff and farmers	NARS, national seed programs and technology transfer staff and farmers/farming groups	Better performance of national seed sector for delivery of quality seeds	Better productivity, yield stability and farm incomes through use of quality seed
	One MS/PhD student complete his post-graduate research under joint supervision	NARS and national seed programs	Better performance of national seed sector for delivery of quality seeds	Better understanding of seed supply constraints and seeking possible solutions
Output 3: Seed of promising and major improved varieties of barley, wheat, food and feed legumes available to NARS and national seed programs		NARS and national seed programs	Increased availability of seed of improved varieties of mandate crops	Improved farm production and productivity due to availability of quality seed of improved varieties
2008	Elite seed of promising lines and improved varieties of barley, wheat, food and feed legumes produced and supplied to NARS and national seed programs	NARS and national seed programs	Increased availability of seed of improved varieties of mandate crops	Improved farm production and productivity due to availability of quality seed of improved varieties
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