



Agricultural Innovation Systems Investment
Sourcebook: Concept Note

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1. Introduction

Agriculture in the twenty-first century continues to be the foundation for sustainable development and poverty reduction. Over the years, support to technology development and advisory services has been one of the key strategies to improve and maintain productivity. The World Bank alone has invested more than 2.5 billion USD into agricultural R&D and advisory services over the past 20 years.

Challenges with innovation. Many of these investments have also been successful and resulted in very high returns and pro-poor growth. However, investments into strengthened research systems and increased availability of knowledge have not necessarily resulted in greater use of knowledge and innovation in the agriculture sector (Rajalahti et al. 2005). Farmer productivity is still often constrained by lack of appropriate technology or access to technology, inputs, services and credit, and by farmers' inability to bear risks. In addition, farmers' information and skills gap constrains the adoption of available technologies and management practices or reduces their technical efficiency when adopted. Similarly, the collaboration between public and private sector remains fairly limited, and the needs of the private sector remain mostly unmet. The overall business environment and infrastructure is often not conducive to increased production and value addition.

Many of the obstacles to innovation are associated with access to knowledge and technology and center on relevance, effectiveness, responsiveness, and accountability of the agricultural organizations and services (World Bank 2005). For example, farmers' or entrepreneurs' needs are often not sufficiently integrated into research and extension agendas. Frequently, the knowledge and the technologies produced are not widely taken up. In addition, human capital and operating resources often constrain the performance of service providers, suggesting inadequate investments – quantity and quality - into human resource development capital and challenges with the training and educational institutions.

Investments into research, extension and education or access to knowledge and technology alone, however, do not guarantee that farmers and entrepreneurs are able to adopt technologies, use knowledge and innovate. **The purpose** of this Concept Note, as specified in section 5, is to illustrate that additional interventions centering on innovation capacity and enabling environment may be warranted to enhance innovation. The final purpose is to develop an Agricultural Innovation Systems Investment Sourcebook that provides a menu of tools and guidance to invest in agricultural innovation in different contexts. Prior to describing the rationale for this new sourcebook, the concept note summarizes the efforts and lessons learned on investing in innovation and introduces innovation systems approach.

2. A summary of efforts at addressing challenges with access to knowledge and innovation

Low spending on R&D is one of the obstacles to innovation. However, many public **research organizations** face also serious institutional constraints that inhibit their effectiveness and further constrain their ability to attract funds. The box 1 below summarizes the main constraints associated with research organizations.

Box 1. Common problems in public research organizations

Common problems identified in reviews of World Bank support to agricultural research result from strong path-dependency in institutional development and slow institutional and policy change:

- Lack of consensus on a strategic vision for public sector research organizations and the evolution of the research system.
- Ineffective leadership for many research organizations, resulting in internal management problems and lack of political support and funding for research.
- Continued emphasis on building centralized national agricultural research organizations/institutes (NAROs/NARIs) at the expense of fostering a public-private system, including universities.
- Difficulties in establishing an appropriate legal and governance framework for research organizations to provide the efficiency and flexibility needed in managing financial, physical, and human resources.
- Loss of highly qualified scientific staff, and difficulties in recruiting the best and the brightest.
- Weak links between NAROs and other research providers, clients, technology transfer agencies, and development organizations.
- Weak accountability to clients and funders.

World Bank 2005.

Several efforts and reforms in research organizations – typically considered to be the main driver of innovation and growth - have been promoted over the years to address the multiple challenges with farmer and entrepreneur innovation. These efforts have centered on moving from investments into physical infrastructure, equipment, human resource development and operational funds toward improving the management of existing public research sector organizations through better planning, improved financial management, greater accountability, and increasing the relevance of programs to clients, e.g., through multi-stakeholder boards or research-extension linkages. In addition, significant effort has been focused on increasing client participation and financing and overall development of pluralistic agricultural knowledge and information systems (adapted from World Bank 2006).

Similarly, **extension services** have faced numerous challenges and efforts at improving them. Public services have dominated extension, with often widespread problems with inadequate funding for recurrent costs, insufficient technology, poor links to research, limited farmer participation, limited understanding of markets needs, a top-down mentality and weak evidence of impact. Extension staff quality has often been a major constraint, and staff training programs have been inadequate to correct deficiencies (adapted from World Bank 2005).

Accordingly, extension programs have been moving away from centralized systems and transferred to local governments the responsibility for delivering extension and, in some cases, financing it, in line with wider efforts to decentralize government. Although there are good reasons to decentralize extension, general difficulties in decentralization, as well as local political capture, have in some cases compromised progress in delivering more effective advisory services (WDR 2008). Most extension programs have also aimed at addressing the weak linkages between research, extension and farmers, e.g.,

through specific committees, stakeholder panels or semi-autonomous agencies. In many occasions, extension systems have acknowledged the need to build social capital among the farmers, pay greater attention to the needs of women and facilitate better links to markets. It has become increasingly clear that no single extension model is universally relevant, and situation-specific models need to be developed based on general principles and analyses of specific farming systems and social conditions. Box 2 below summarizes the more recent efforts at reforming agricultural services.

Box 2. A summary of the more recent efforts at reforming agricultural services:

- *Farmer, private sector, and other stakeholder participation on research governing boards and advisory panels*, to attain real influence over research decisions and priorities. Participation of women farmers is particularly important, given their crucial role in rural production systems, the special constraints under which they operate (for example, time constraints), and their range of activities and enterprises, including marketing, agro-processing, and food storage.
- *Decentralizing research, to bring scientists closer to clients and better focus research on local problems and opportunities.*
- *Decentralized extension services* accountable to local user groups, to facilitate client “purchase” of research services and products that respond to their needs. Matching grant programs for farmer and community groups allow them to test and disseminate new technologies.
- *Competitive funding*, to promote demand-driven research by involving key *stakeholders, especially users*, in setting priorities, formulating projects, and screening proposals. Competitive funds have also increased the role of universities in agricultural R&D in some countries. On-going challenges include e.g., limited engagement with the private sector, sustainability of the funding, bias against strategic R&D, and the heavy transaction costs.
- *Producer organizations* have been increasingly promoted to reach economies of scale in services and market activities, and to increase farmers’ ability to demand better services and their ability to hold service providers accountable.
- *Mixing public and private systems, involving farmer organizations, NGOs, and public agencies* contracting out extension services, to find a ‘best fit’ and recognize the private-good attributes of some of the extension services. For example, approaches based on public funding but with involvement of the local governments, private sector, NGOs, and producer organizations in extension delivery may be most relevant to subsistence-oriented farmers, whereas with agricultural commercialization, various forms of private co-financing are appropriate, through to full privatization for some services.

Education and training institutions have a significant role in human resource development as well as a source of knowledge and technology. The World Bank investments into **agricultural education and training** (AET) have however declined to nearly non-existent levels since early 1990’s. Based on other reviews, this trend is similar among governments and donors alike (World Bank 2008). A recent World bank study on AET in Sub-Saharan Africa summarized the main constraints on AET being: (i) AET supply is often out of synch with labor market demands in terms of knowledge and practical competencies, especially agribusiness, business and program management, and problem-solving skills; (ii) AET is not realizing its potential contribution to agricultural development because of poor linkages with research and isolation from knowledge sources; (iii) external problems, such as fragmented organizational responsibilities for

AET, and internal problems in terms of under-funding, unattractive working conditions and consequent staff depletion, contribute to AET underachievement.

Despite this dim view, global experience shows that it is possible to build productive and financially sustainable education systems (World Bank 2008). The following six factors have been important in raising the issues and achieving success: (i) mobilizing and sustaining political support for AET investments; (ii) public investment in capacity building has been essential for creating the scientific leadership necessary to implement each country's strategy for agricultural development; (iii) building a system of core AET institutions is a process of capacity accumulation that takes sustained commitment over multiple generations to produce returns; (iv) the administrative separation of research and higher education cripples the development of national agricultural innovation systems; (v) massive campaigns to develop human capital have worked in many countries; (vi) and incentives are necessary to retain staff in research, extension, and education.

Although the efforts on reforming agricultural services have not always been successful, they represent a growing spectrum of initiatives to engage farmers and others more fully in the research and extension process. The result is that many agricultural research and extension systems have adopted features that facilitate better notice of client demand, work with farmer groups, have improved communication skills, and collaborate with the private sector.

Changing context with new challenges. Parallel to the research and extension reform efforts, the context and knowledge intensiveness of agriculture have changed rapidly, i.e., drivers for innovation are rapidly changing. Increasingly markets, urbanization and globalization, e.g., through changing patterns of consumption, competition and trade rules, rather than production drives agricultural development. Advancements in biotechnology have accelerated technical innovation, but also pose challenges and opportunities. The role of private sector in knowledge generation, use and dissemination has significantly increased – private sector increasingly develops and supplies technologies to farmers. Similarly, ICT has radically changed the pace and accessibility of knowledge and information. It is obvious that knowledge is increasingly relying on multiple knowledge providers – besides the research, extension, education and private sector, the farm community, farmer associations, and nongovernmental organizations now also interact to generate new ideas or develop responses to changing conditions (adapted from World Bank 2006). Similarly, new challenges are imposed by trans-boundary diseases and the eminent climate change that requires both adaptation and mitigation measures, with significant implications for the knowledge system.

3. Innovation systems approach

All the above pose both challenges and opportunities for the agricultural knowledge systems. Important questions include but are not limited to: how do we maintain the sustainability of agricultural production base, in an increasingly fragile and 'scarce' conditions; how do we ensure poor smallholders' needs are taken account of; how do we establish efficient value chains and retain competitiveness; how do we take advantage of the new platform technologies (ICT and biotechnology); and how do we

cope with climate change? In a changing context, if farmers, companies and countries are to cope, compete, and survive, they need to innovate continuously.

It is expected that public sector will remain an important provider and/or funder of R&D, education and extension services in the developing countries. At the moment, 94% of the agricultural R&D investment in the developing world is still public sector investment (WDR 2008). But if markets are driving the agenda, and new actors are more prominent, what is the proper role of public sector? What should be left to private sector?

How do we design and invest in a manner that is conducive to innovation and growth – in essence what are the remaining challenges and missing issues that have not been addressed? This is an important question - while investments in (public) R&D, extension and education organizations and linkages between them remain important, these have tended not to be sufficient to meet today's challenges and rapidly changing context. A more flexible approach that better fits these conditions and enables knowledge generation, use and innovation in different contexts is needed.

Innovation systems concept. Such flexible approach may be provided by innovation systems approach that emerged already in the 1970s and 1980s and has its origin in the evolutionary economics. Several investigators observed that the more successful economies possessed what they described as an effective national system of innovation (Freeman 1987; Lundvall 1992). These systems developed in an often network-based setting which fostered interaction and learning among scientific and entrepreneurial actors in the public and private sector in response to changing economic and technical conditions (World Bank 2006).

An innovation systems concept will be useful for analyzing and identifying how to plan investments promoting innovation by offering a holistic explanation of how knowledge is produced, diffused, and used and by emphasizing the actors (such as private sector, producer organizations) and processes (such as scoping, collective action, partnerships) that have become increasingly important in agricultural development. The concept focuses on interventions that go beyond research and extension investments – thus, the *additional insights* and *types of interventions* that can be gained from an innovation systems perspective (World Bank 2006).

Studies on innovation indicate that ability to innovate is often related to collective action and knowledge exchange among diverse actors, incentives and resources available for collaboration, and having in place conditions that enable adoption and innovation e.g., by farmers or entrepreneurs (World Bank 2006). A number of examples featured in box 3 provide information on how innovation has occurred in agriculture.

Box 3. Examples on Agricultural Innovation

Below is a list of a few different cases on innovation in agriculture. In some cases, sub-sector growth was induced by marked demand factors and thereby the role of the private sector as a driver of innovation was significant. In some others the sector growth was stimulated by the public sector interventions, such as policy, R&D, and other incentives.

Cassava processing innovation system, Ghana

- Research led development and promotion of new cassava products with private sector coalition

Cut flower innovation system, Colombia

- Continuous innovation in response to changing markets, licensing foreign technology, coordinated by an industry association

Medicinal plants innovation system, India

- Mobilising traditional and scientific knowledge for rural communities, coordinated by a foundation

Small-scale irrigation innovation system, Bangladesh

- Civil society organisation promoted low-cost pump to create markets. Small-scale manufacturers then innovated with pump designs in response to local needs

Golden rice innovation system, Global

- Complex partnership of multinational crops, internal agricultural research organisations and universities and development foundations. Complex but creative institutional arrangements over ownership and used to target the poor

Potato, Peru

- International research center facilitated development of new indigenous potato products with a coalition consisting of research, small-holders, and multiple private sector actors (supermarkets, traders, restaurants, etc)

While the drivers for innovation and growth were different and the role of research and extension varied, the cases shared common characteristics in the way the sector actors addressed challenges and innovated. Despite sector development, the sectors gradually faced challenges and their success at addressing those challenges - meeting stringent quality standards, remain competitive, respond to changing consumer taste, addressing technological challenges, etc - was often related to the actors ability to improve interaction and weak linkages with each other. All the cases illustrated the importance of collective action, facilitation and coordination by intermediaries, building skills base, and creating an enabling environment for innovation to take place.

Source: Bernet et al. 2006; Hall, A.; Hall et al. 2007; Rajalahti, R.; World Bank 2006.

The “**agricultural innovation systems**” (**AIS**) **concept/approach** has been developed to better understand how a country’s agricultural sector can make better use of new knowledge and design alternative interventions that go beyond research investments.

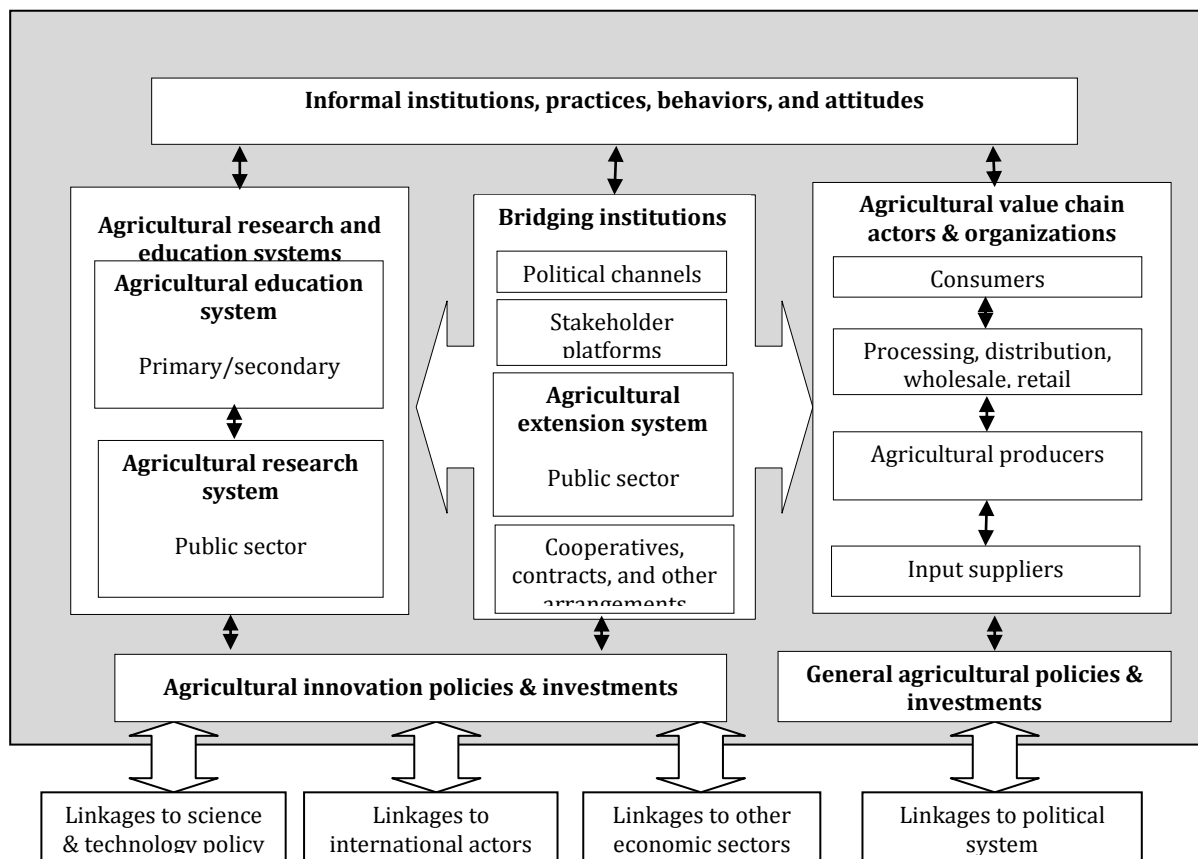
A simplified conceptual framework of AIS is presented in Figure 1. The framework illustrates the main actors (e.g., typical agriculture knowledge and technology providers and users as well as bridging/intermediary institutions and actors that facilitate interaction among them), their potential interactions with each other, all influenced by the agricultural policy context and the overall informal institutions, attitudes and practices that either support or hinder innovative processes.

Thus, the AIS approach takes notice of the importance to build strong organizations and build effective research-extension-farmer linkages, but goes beyond this to take notice of the additional features needed for actors to collaborate and respond to needs (such as professional skills, incentives for partnerships, better knowledge flow, etc) and the wider enabling factors that must be put into place for actors to innovate.

To summarize, the AIS approach may offer:

- **Analysis:** Means to systematically analyze the roles of R&D and a broad range of actors, their interaction, and other enabling factors for knowledge use and innovation resulting in growth. Useful way to look beyond R&D capacity, research-extension linkages and PPPs for R&D as a source of innovation – and acknowledge the need to pay more attention to the role of multiple actors, including PS in innovation, and focus on knowledge use from the very beginning
- **Prioritization:** Means to identify the key constraints, opportunities and priorities for investing in innovation capacity and other enabling factors. By prioritizing and acknowledging that countries and sectors are at different development phases, it allows a phased approach to investing in a given development phase/context.
- **Additional focus:** Brings systematic attention to coordination and collaboration, incentives for knowledge , technology use and partnerships, and crucial enabling factors;

Figure 1. A conceptual diagram of an agricultural innovation system



Source: Spielman and Birner (2008); adapted from Arnold and Bell (2001).

4. Rationale for a new ESW

On-going investments. Over the years, the World Bank has invested in agricultural research, extension and education & training. The annual commitments vary between \$100 million and \$700 million. A trend of significant concern is the very limited commitments into agricultural tertiary education since early 1990's. Based on other reviews, this trend is similar among governments and donors alike (World Bank 2008).

A review of the World Bank AIS focused portfolio (1990-2006) revealed that investments have already shifted towards a more pluralistic approach with greater inclusiveness and actors, diverse funding modalities, and support to an enabling environment conducive to innovation. However, a number of challenges and needs for improvement have been identified on two fronts, namely innovation capacity and enabling environment. Innovation capacity may be further enhanced by (i) strengthening of sector coordination and partnership formation through effective inclusion of coordinating bodies as well as financial organizations (such as banks, credit unions, futures trading, micro credit providers); (ii) addressing regional differences in organizational culture and learning - particularly targeting attitudes among actors that restrict collaboration; (iii) enhancing further inclusiveness through establishing sustainable research and service provision that is pluralistic and also demand-driven; (iv) providing incentives for partnerships and collaboration more frequently through financing modalities such as competitive grants, public-private partnerships, matching grants, incubators, cost-sharing and co-financing and through capacity building on contractual arrangements; (v) strengthening of agricultural training and education through increased investments overall, and particularly on aspects such as innovative capabilities of organizations and individuals and organizations cultures and alignment with sector needs; (vi) supporting investments for the enabling environment could expand to cover business development support, knowledge and market information systems, and necessary policy and legal reforms (adapted from Rygnestad et al. 2007).

Capturing the lessons and generating new knowledge. A lot of learning on innovation and AIS has already taken place within the World Bank lending operations as well as by several countries and other donors. At the same time, there are several areas where further learning is needed. The AIS is an evolving framework - no blueprint exists – and therefore investing in and operationalizing the AIS approach, that shows promise to promote innovation, poverty reduction, and growth, requires significant efforts at collecting and synthesizing the diverse experiences in AIS. Thus, there is a need to **analyze and generate knowledge on the lessons learned on investments into R&D, extension, and education and the additional investments associated with innovation systems.**

Areas of new analysis. While the AIS approach builds on the NARS (that focused on strengthened research supply) and AKIS approaches¹ (that gave much more attention to links between research, education, and extension and to identifying farmers' demand for new technologies) (see annex 1 for a summary) that guided the previous investments, it features distinct additional areas of investment that require this further analysis and

¹ NARS = National Agriculture Research System; AKIS = Agricultural Knowledge and Information System

understanding. The table 2 below summarizes the five main intervention areas in which AIS distinguishes and clearly provides additional – often the missing - ways of promoting innovation (not all interventions are necessarily needed). These center on collective action at diverse levels, enhanced interaction and knowledge flows within and across organizations and sectors, investments that promote/enable knowledge use, provision of incentives and capacity to engage the private sector, and the other enabling factors.

Table 2. The main additional interventions/areas to invest in associated with AIS approach, compared to strengthening NARS or building the AKIS.

Focus investment/ Activity	Examples
Focus on joint action - organization of stakeholders at diverse levels	National innovation committee/council Industry-agribusiness-(sub-) sector level associations, coordination committees or boards Producer Organizations
Enhancing interaction, learning and knowledge flow within organizations and across organizations and sectors	Information venues such as annual consultation/knowledge sharing workshops, Stakeholder platform (consultative/planning/integrative) Virtual platforms, web interface Sector or industry networks Knowledge brokers and skills
Focus on outcomes - putting ideas to use	Technology transfer units, Technology Fairs Pilots on new technologies and practices Training for professional skills, IPR, entrepreneurship Technology incubators Technology foundations for transfer and commercialization
Private sector's role as a significant player and innovator -- requires capacity and incentives for all actors	Innovation funds, incubators, match-making services, etc Lower transaction costs - organization of actors Training, internships programs, university-industry curricula Units for special services and communication
Parallel or coordinated investments into enabling factors	Infrastructure, Market development, Financial services, Regulatory issues - IPR, standards, etc

However, assessing, designing and investing in AIS in lending operations may require a wider set of tools and means (than presented in the summary table 2). These can be

divided roughly to seven main groups: (i) assessment of AIS; (ii) scoping; (iii) coordination and collective action; (iv) building innovation capacity, (v) providing incentives for interaction, linkages and innovative partnerships, (vi) complimentary enabling investments; and (vii) monitoring and evaluation – all briefly discussed in the below paragraphs.

Before any intervention, one however has to give consideration for a few essential issues: (i) Each country or a sector is at a different stage of development, and typically requires interventions that fit the phase; (ii) optimal resources – human or financial - are rarely available; (iii) a step-by-step, incremental approach is often advisable; and (iv) the scale of operations may vary - sub-sector vs. local/zonal vs. sub-regional vs. national. Given this variation, one has to prioritize, sequence & tailor the investments to fit the needs, challenges and resources available (Rajalahti et al. 2008).

The interventions may include the following:

To have an idea of the level of development and the strengths and weaknesses of the AIS, it is important to **assess the status of AIS**, including the critical actors, their interaction and linkages with each other, and overall conditions for innovation. Examples of appropriate tools include the AIS framework, Actor Linkage Matrix, NetMap Tool and Benchmarking tools.

Similarly, **scoping** is needed to develop a joint perspective on the future goals and challenges, i.e., identification of needs, opportunities and priority interventions and their limits (e.g. focus on sub-sector/territory/national). It is useful to engage multiple stakeholders, incl. actors from other sectors in these activities, e.g., via stakeholder platforms/committees or alliances, foresight groups, scenario planning and analysis exercises.

Coordination and organization of stakeholders are essential to secure coherence, connectivity and interaction among the activities and actors at appropriate levels. Some of the appropriate interventions include setting up national cross-sectoral or sector specific innovation committees that also facilitate national level scoping, sub-sector/industry committees, associations or networks to enhance joint action and knowledge flow, and building/strengthening producer organizations or community level (self-help) groups to engage the actors e.g., in expressing demand, engaging in research, reaching economies of scale in extension and market activities.

In many countries, the important organizations are not able to meet the demands of the sector. For example, education organizations produce graduates who are poorly equipped to the needs of the field and agribusiness. Similarly, extension providers may focus more on technical issues rather than the varied needs of smallholders tackling with organizational and market challenges. Essential part of promoting innovation is to develop **innovation capacity** for generation of new ideas/ways, technologies, knowledge, innovation and collaboration. Besides technical, fiscal and management capacity of the actors, particularly those of R&D, extension and education, it is important to build the professional skills (communication, contractual, IPR, entrepreneurial understanding) of the actors. Other examples of important interventions include aligning education programs with sector and AIS needs, developing university-industry joint programs, building professional skills among all actors, setting up units/platforms, programs and practices that enable communication, knowledge exchange and knowledge use.

While capacity is essential, partnerships for and business development often require appropriate incentives, particularly to engage the private sector in R&D, technology transfer, and joint business activities. Examples of potential interventions include establishment of units for business promotion, setting up foundations or innovation funds, e.g., competitive (research) funds or matching grants for productive partnerships between public, private and farmers, setting up incubators or science/technology parks that promote commercialization of technologies or technology transfer (often associated with support services, such match-making, contractual procedures, IPR facilitation, ICT, start-up funds, etc), promotion of sub-sector/commodity clusters that bring together diverse actors to benefit from economies of scale, geographic proximity and many public good nature activities such as infra, or providing tax breaks for agro-industries for R&D.

Farmers and entrepreneurs will not innovate in conditions that are strongly unfavorable. Therefore, **complimentary enabling investments** that are conducive for innovation and business development are needed. In theory a number of different aspects could be covered, however, resource availability, sequencing and prioritization are needed to address aspects such as infrastructure (roads or irrigation), market development, policy (e.g., trade & investment, resource allocation), regulatory frameworks (e.g., standards, biosafety, IPR, etc) and financial services.

Monitoring and evaluation (M&E). M&E of AIS will rely on both existing and new tools. Progress has been made in identifying specific innovation indicators, capturing the network nature of AIS, as well as in developing national-level benchmarking tools. Similarly there are tools for assessing the impact of investments into research, extension and education. However, there are relatively few tools that capture the impact of a systems approach, requiring further development.

5. Objective

The purpose of the task is to develop an AIS Investment Sourcebook that provides a menu of tools and guidance to invest in agricultural innovation in different contexts. The content is drawn on tested good practice examples and innovative approaches with emphasis on lessons learned, benefits and impacts, implementation issues, and replicability.

6. Target audience

The main target audience consists of operational staff of donor organizations and relevant client country organizations.

The secondary audience consists of: Civil society organizations; Professional associations and networks of the specific topics involved; Innovation systems networks and organizations; Academic community and International agriculture research organizations including CCIAR.

7. Output

The primary product is a World Bank published ESW report that provides operational guidelines and good practice lessons for designing and investing in Agricultural Innovation System in a given context. The report will be available in a web format, such as Wikipedia, to allow easy updating and inputs by others, or in a CD format.

The secondary outputs include ARD Notes on selected sourcebook modules. These will be available as hardcopies.

8. Methodology

The Methodology section addresses the scope of the Sourcebook; the ‘research’ process to bring about and integrate the key principles and innovative activities for the different modules in AIS Sourcebook and the structure and format of the modules.

8.1. Scope

The rural strategy of the WB recognizes the central role of agriculture as both a source of rural livelihoods and as a crucial medium for poverty reduction. The main focus of the sourcebook – the thematic notes and examples - will be on agriculture. However, general experience and lessons will be drawn from other sectors. Non-agricultural rural issues will be addressed in the Sourcebook as deemed necessary: rural finance; business development, S&T policies; etc.

As overarching themes, the sourcebook will take notice of the climate change adaptation and mitigation aspects and gender issues, and integrate them in the modules as appropriate.

8.2. Research methods

Lessons from other sourcebooks. ARD has developed a number of investment sourcebooks with valuable lessons: (i) It has proven essential to compile lessons and examples from diverse regions; (ii) it is important, particularly given that there are different schools of AIS, to reflect on diverse approaches and contexts; (iii) it is important to retain the good practice and example structure rather than develop a toolkit; (iv) efforts in dissemination aspects have often been underestimated; and (v) it is important to include private sector as a contributor and as a target group. Besides building on the relevant sourcebooks and specific chapters, the AIS sourcebook process will take notice of these important lessons.

Process. The sourcebook modules will be developed through a series of research methods and processes including:

- **Community of practice:** The development of the sourcebook requires diverse expertise and serves as an opportunity to ‘establish’ a community of practice on AIS. The contents of the sourcebook will be assembled from all regions in which the WB operates, with inputs from individual experts and practitioners and diverse organizations including donors such as WB and WBI, InfoDev and IFC, CIRAD, CTA, FAO, IFAD, UNU-MERIT, ICRA, KIT, CGIAR to name a few as well as experts from NARS, private sector, farmer organizations, etc. Experts outside

agriculture sector will be specifically consulted to draw on the rich and long-term experience outside the agriculture sector. It is essential that the diverse lessons are brought together and that duplication of work will be avoided to the extent it is feasible.

- A review of existing sourcebooks on agriculture, gender in agriculture and water for agriculture and other agriculture literature – particularly for relevant information on agricultural research and development, advisory services, rural producer organizations, market development, irrigation and rural roads, etc.
- A review of relevant innovation systems literature in agriculture as well as other sectors.
- Development of reviews and synthesis papers on ‘new’ activities and investments, i.e., issues with less agricultural experience (incubators, science parks, clusters, etc).
- *Consultative sessions and focus group discussions*: While the main source of information is project documents and studies as well as the experience of the module coordinators and contributors, consultative sessions and focus group discussions (in the form of face-to-face meetings, teleconferences, or email exchanges) are an option to draw on experiences in both operation and policy of Task Managers from the WB and other relevant organizations.

8.3. Structure of the Sourcebook

The proposed structure would follow that of the Agriculture Investment Sourcebook². As presented above, the AIS Sourcebook will address the issues in thematically focused modules, and each of these modules is structured in four major parts:

- *Overall Sourcebook Overview* (10-15 pages)³: The team will include a Sourcebook introductory or overview chapter, on top of the modules, to set the boundaries, define the key issues and approaches, and the conceptual framework to frame the issues and serve to organize and link the modules together.
- *Module Overview* (approximately 8-9 pages): Presents a summary of the major issues and investment options within this module, provides a link with the Thematic Notes and Innovative Activity Profiles included in this module, and is intended as a broad introduction to the topic.
- *Thematic Notes* (TN) (approximately 7-8 pages each): Summarize approaches and programs that have already been proven on the ground and that can be recommended for implementation and scaling up; provide a link to the Innovative Activity Profiles included in this module; and provide a brief but technically sound overview for the non-specialist. Each Module will have three (3) to five (5) TNs.
- *Innovative Activity Profiles (good practice innovations)* (IAP) (3-5 pages each): Highlight design features of a innovative project or an activity showing promise

²

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/EXTAGISOU/0,,contentMDK:20974103~menuPK:2802192~pagePK:64168445~piPK:64168309~theSitePK:2502781,00.html>

³ The number of pages applies to single-spaced and 12-font sized document and includes 4-8 references for the Overview and 4-6 references for the TNs.

on the ground already in implementation for at least 2-3 years. Each Module will host three (3) to five (5) IAPs.

9. Organization and content of Modules in the AIS Sourcebook

The AIS sourcebook aims at adding value to the relevant sections in existing sourcebooks, i.e., agriculture (particularly modules on policy & institutional capacity, S&T, extension and information services, agribusiness & market development), gender in agriculture (particularly modules on governance, markets and innovation & education) and land and forestry sourcebooks, rather than replicating what is already available. The module overviews will specifically synthesize the relevant lessons on past NARS and AKIS approaches, and what is already available in the sourcebooks. Cross-referencing to other sourcebooks will be also used as appropriate.

The sourcebook will address the diverse issues illustrated in the AIS framework, with a special emphasis on how to promote innovation among the diverse actors, i.e., the additional features (associated with AIS compared to NARS and AKIS) and the 'new' interventions that are needed for innovation to take place. The role of public and private sector will be addressed in each module.

Investing in AIS in lending operations requires a wide set of tools and interventions. The sourcebook will be divided roughly to seven main modules, that follow the *logic of project cycle approach* or phased approach used by practitioners: (i) assessment of AIS; (ii) scoping activities, (iii) coordination and organization of stakeholders; (iv) building innovation capacity, (v) providing incentives for interaction, linkages and innovative partnerships, (vi) complimentary enabling investments, and M&E. Table 3 presents the modules that comprise the AIS Sourcebook, including the timing for completing the module. Each module will be developed in greater details once the work commences.

Table 3. Modules and year of completion of the AIS Sourcebook

	Name of Module and rationale/ Examples of priority themes to be covered¹	Year of Completion
	Sourcebook Overview An introductory chapter that sets the boundaries, defines the key issues and approaches, and the conceptual framework to frame the issues and serve to organize and link the modules together.	FY10
1.	Assessing Innovation Systems - to assess the status of AIS, incl. the critical factors, actors and conditions for innovation AIS Assessment Framework, Actor Matrix, NetMap Tool, Benchmarking, Organizational/institutional assessment tools	FY10
2.	Needs, opportunities and priorities for investments- scoping activities to develop a joint perspective on the future goals and challenges Scenario Planning, Foresight Groups, Stakeholder Platforms/Alliances, etc	FY10
3.	Organization of actors - coordination and organization of stakeholders to secure coherence, connectivity and interaction among the activities and actors and to enhance joint action and knowledge flow Producer organizations and self-help groups	FY10

	Professional networks and associations Industry-agribusiness/sub-sector committees, councils or foundations National Innovation/sector innovation committees or councils	
4.	Building innovation capacity and strengthened organizations – building capacity for generation of new knowledge and practices, with emphasis on collaboration and innovation (skills, practices, organizations) among key actors such as agricultural education and training; advisory services; research; private sector; associations, and farmers	FY10
	Past lessons on and investments options in research, extension, and education will be summarized in this module. In addition, the module will address at least the following 'new' topics: Building new skills: Training for professional skills, IPR, entrepreneurship Education sector: Aligning curricula along with AIS needs (trainings, internship programs, university-industry curricula, etc) Knowledge flow and use: Units for special services and communication/ technology transfer, virtual platforms and web interface; technology fairs, pilot programs Extension: from knowledge transfer toward knowledge brokers	FY10
5.	Incentives for innovation partnerships and business development - to enable the actors use their strengthened capacity for productive and innovative partnerships and new businesses development.	FY10, FY11
	Innovation funds, incl. matching grants and competitive research funds Sub-sector/commodity clusters Agriculture incubators, science parks, and foundations for technology transfer and commercialization (incl. appropriate support services)	FY10 FY11 FY10 FY11
6.	Enabling investments - selected and prioritized investments into enabling factors to provide an environment conducive for innovation and business development (limited number of topics will be addressed by the sourcebook)	FY10, FY11
	Infrastructure Market development Policy issues, e.g., trade & investment, IPR Regulatory frameworks, e.g., standards, biosafety, IPR	
7.	Monitoring and Evaluation Emphasis on AIS indicators and assessment for systems impact	FY11

¹ The contents of the module may be modified also to fit the availability of resources.

FY10 runs from July 2009 to June 2010.

10. Review Process

There will be a total of eight (8) overall reviewers of the AIS Sourcebook comprising of experts in operation and policy dimensions on agriculture, S&T and AIS approaches. The six reviewers will consist of 3 internal reviewers and 6 external reviewers (see Table 4 for the names of reviewers). For specific modules, the team will select 2-3 reviewers each (the components can have separate set of reviewers if required).

Table 4. List of overall reviewers for the AIS Sourcebook

Agency	Name of reviewers
<u>Internal</u>	
WB	Willem Janssen, Lead Agriculture Specialist, LCR
WB	Adolfo Brizzi, Country Manager, Madagascar
WB	Alfred Watkins, S&T Coordinator
<u>External</u>	
Syngenta	Marco Ferroni, Executive Director
ICAR, India	Dr Mruthyunjaya, Director of NAIP
IFAD	Rodney Cooke, Director, Technical Advisory Division
DFID	Jonathan Wadsworth, Senior Agric. Research Adviser
IFPRI	Regina Birner, Senior Research Fellow

11. Sourcebook Dissemination Strategy

Dissemination Events and Process:

- i. Launch workshop in the World Bank as part of overall Sourcebook dissemination
- ii. Sourcebook availability advertised through ARD and other WB web sites and through Global Donor Platform website
- iii. The Wikipedia format of the sourcebook advertised through websites and emailing to target audience members, and development information dissemination platforms
- iv. Shorter version of selected modules in the form of ARD Notes will be printed and distributed to target audience.
- v. Inclusion in the SASKI (sustainable Agriculture, Knowledge Institutions) and STI GET (Science and Technology Global Excellence Team) BBL series on AIS
- vi. Training events targeting World Bank operational staff (e.g., during the annual Rural Week) and client staff through WBI-led capacity-building events (e.g., the planned WBI-ARD collaboration on video-conference seminar and training series)

12. Coordination

ARD Core Task Force (TF):

- Project Manager: Riikka Rajalahti, Sr Agricultural Specialist, ARD, WB
- Sourcebook Coordinator (part-time): Andrea Pape-Christiansen, ARD, WB
- Other members: Eija Pehu (see contact information below)

Wider WB TF (to be consulted etc in the process):

- Regional colleagues: from each region, at least one representative engaged (e.g., Johannes Woelcke/Indira Ekanayake– AFR; Willem Janssen – LCR; Pierre Rondot – MNA; Doina Petrescu – ECA; Shobha Shetty – EAP; Grahame Dixie/Animesh Shrivastava – SAR), as well as Seth Ayers (InfoDev), Kurt Larsen (WBI) and Manuel Lantin (CGIAR Secretariat).

Tasks, primarily of the ARD TF:

- The Sourcebook Taskforce is responsible for the overall coordination, conceptual and component design of the Sourcebook, identification of overall reviewers, overall quality control, and design and dissemination of the output.
- Day-to-day coordination of contracting contributors, TF correspondence, and production/publication will be conducted by the Sourcebook Coordinator on behalf of the Project Manager from the WB.
- A spreadsheet of updates (similar to the one used for the AIS) will be used as a management tool to inform the Taskforce of the progress of each module (to be populated by the lead agency of each module and emailed every two weeks). Overall module coordination (comprising design; identification of module component contributors; and quality control) will be led by the Module Coordinator.
- Consultants/ staff may be signed on as authors for the various Overviews, TNs, and IAPs.
- For consistency and to ensure that the Conceptual Framework is followed, authors will be given a guide/checklist to guide them in writing the TNs and IAPS. The guide/checklist including the Conceptual Framework will be included in the Terms of Reference (TOR).

13. Timeline

Activity	Time
Concept Note Review	April 18th, 2009
First 4 modules	June 2010
Modules 5 to 7 draft*	Fall 2010
Peer review*	Fall 2010
Copyediting-production	Early Spring 2011

Dissemination	Spring 2011-Fall 2011
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* The modules are expected to be developed at different times, thereby the drafts and reviews will be sequenced – see table 3 for further details. The final review refers to the final sourcebook.

14. Taskforce contact list

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	Regional colleagues InfoDev and WBI		

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Annex 1. A summary of the different approaches to investing in innovation

Table 1 below captures the main differences and changes in emphasis in our investments into innovation. The emphasis has shifted from the 1980s focus on national agricultural research systems (NARS) and investments in infrastructure, research capacity, management, and policy support to 1990s agricultural knowledge and information system (AKIS) approach that focused more on farmer demand. More recently, an innovation system approach that builds on the previous approaches has guided investments to knowledge generation and use. The table 1 below summarizes the scope, focus and actors in three evolving approaches to strengthen innovation capacity.

Table 1. The main characteristics of the three main frameworks used in promoting and investing knowledge in agriculture sector.

Defining feature	NARS	AKIS	AIS
Actors	Research organizations	Farmer, research, extension and education	Wide spectrum of actors
Outcome	Technology invention and technology transfer	Technology adoption and innovation	Different types of innovation
Organizing principle	Using science to create new technologies	Accessing agricultural knowledge	New uses of knowledge for social and economic change
Mechanism for innovation	Technology transfers	Knowledge and information exchanges	Interaction and innovation among stakeholders
Role of policy	Resource allocation, priority setting	Linking research, extension and education	Enabling innovation
Nature of capacity strengthening	Strengthening infrastructure and human resources	Strengthening communication between actors in rural areas	Strengthening interactions between all actors; creating an enabling environment

NARS = National Agricultural Research System; AKIS = Agricultural Knowledge Information Systems; AIS = Agricultural Innovation System.

Source: World Bank 2006.

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