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**Commentary**

**Agricultural Knowledge and Development in a New Age and a Different World**

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**Abstract**

The paper examines developments and issues regarding agricultural knowledge systems which affect agricultural development. It covers three purposes. The first is to review the evolution of four international agricultural knowledge frameworks. The second is to examine various initiatives in Latin America with implications worldwide for advancing innovations for agricultural development. Finally, I outline what I consider to be the main elements that tend to make some countries more innovative than others.

**Keywords:** Development, Extension, Innovation Systems, Knowledge Frameworks, Latin America, Organizations

### **Introduction**

Widespread calls for reform of extension systems have brought the institution to an important turning point in the history of agricultural knowledge and development. There is an ongoing “power shift” taking place, from public to private sector enterprise. Globalization challenges all countries to find new and better ways of competing in the world marketplace.

To respond to these challenges, privatization and demand-driven extension approaches are being advocated by international organizations and consortia, including the Consultative Group on International Agricultural Research (CGIAR) and its international agricultural research centers, the World Bank, and the Food and Agricultural Organization of the United Nations, the International Fund for Agricultural Development, the U.N. Development Program, and the multi-agency Neuchâtel Group. Fittingly at its annual conference, held in November 2005 in Berlin, the multi-agency Neuchâtel Group focused its discussion on the advancement of demand-driven research and extension approaches to agriculture.

### **Frameworks**

Frameworks can energize. They can provide structure for both action and study. In this sense, they are like theories that guide practice. Both theories and frameworks can present a plausible or scientifically acceptable general principle that purports to explain how things work, or in the case of frameworks, how things might

work better. Frameworks are a kind of scaffolding around which we can build initiatives. Frameworks are also useful for guiding interventions and investment. Hence, the adoption of a framework by development agencies has political and social as well as programmatic and financial implications.

In the past 50 years, four major frameworks regarding research and extension, and education, have been advanced one after the other by international organizations to promote agricultural development. These four frameworks are useful to review for they clarify how our thinking about research, extension services, and education has evolved and changed over time. The four frameworks are generally known by their acronyms:

- NARI—National Agricultural Research Institutes
- NARS—National Agricultural Research Systems
- AKIS/RD—Agricultural Knowledge and Information System for Rural Development
- AIS—Agricultural Innovation System

These four frameworks gained importance on an international level because they were used by agriculture’s major international organizations, most notably the CGIAR international agricultural research centers, the World Bank, and the FAO. Figure 1 provides an overview of the evolution of these frameworks.

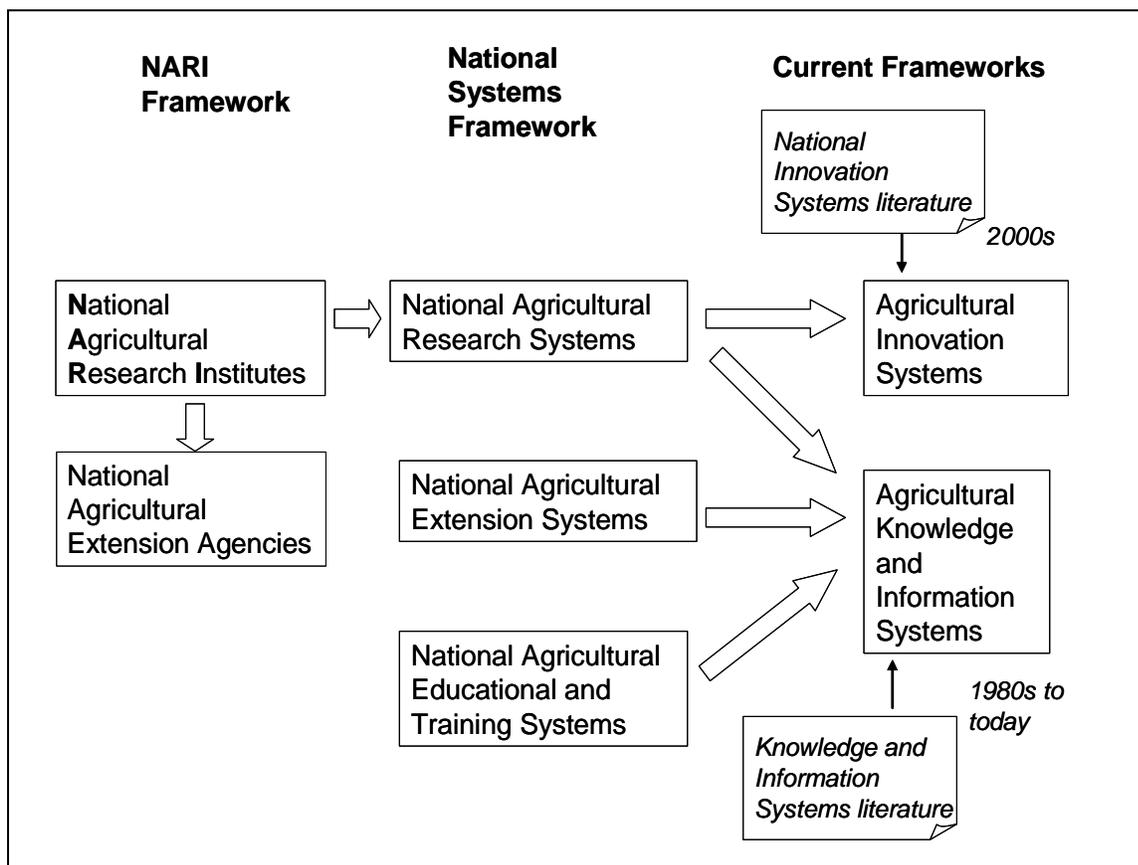


Figure 1. The evolution of knowledge-system frameworks. From “Enabling Agriculture: The Evolution and Promise of Agricultural Knowledge Framework,” by W. M. Rivera, G. Alex, J. Hanson, and R. Birner, 2006, *Proceedings of the 22<sup>nd</sup> Annual Conference of the Association for International Agricultural and Extension Education*, Clearwater Beach Florida, pp. 580-591.

**NARI.** The National Agricultural Research Institutes (NARI) framework was the first framework that emerged after World War II. In this framework, the national agricultural research agencies were seen as the main recipients for international investments. These investments aimed to build the NARI institutions and improve their capacity.

**NARS.** Following the NARI, there emerged a larger framework known as the National Agricultural Systems (NARS) framework, displayed in the second column of Figure 1. This framework includes the main institutions that contribute to the agricultural knowledge flow, including the National Agricultural Extension Systems (NAES) and the National Agricultural Education and Training Systems (NAETS),

as well as the National Agricultural Research Institutes (NARI).

As shown in Figure 1, two frameworks have emerged since the NARI and the NARS. They are the Agricultural Knowledge and Information System (AKIS) framework and the Agricultural Innovation System (AIS) framework.

**AKIS.** The AKIS stresses the need for strong linkages between and among agricultural research, extension and education institutions and organizations in the public, private and “third sector,” which includes non-governmental and civil society community organizations. Developed in the 1970s and 80s (Bunting, 1986; Nagel, 1979; Röling, 1987, 1990) and modified as AKIS/RD by FAO and the World Bank in the mid-1990s, the concept basically stresses

institutional linkages for advancing knowledge systems in agricultural and rural development.

A recent analysis comparing ten country case studies of AKIS/RD (Rivera, Qamar, & Mwandemere, 2005) highlights three ideas: 1) the continuing importance of linking education, research and extension outreach services, 2) the concept of “strategic alignment” to integrate AKIS/RD goals into public and relevant private sector organizations, and 3) a focus on agriculture as an aspect of rural development. The concept of strategic alignment means that within the context of a national innovation strategy agricultural knowledge system institutions and organizations aim to accomplish specific, agreed-upon goals, meanwhile carrying out the functions specific to their general mandate.

*AIS.* The AIS is a most recent concept and an emerging framework for advancing agricultural innovation systems. The agricultural innovation systems approach is a social construct based on the industrial notion of National Innovation Systems or NIS, with roots in evolutionary economics (Balzat, 2002). The AIS seeks to promote the concept of a *sectoral innovation system*, an approach that grew out of the NIS and was advanced in the mid-1990s (Breschi & Malerba, 1997).

What is a “national innovation system?” According to economists Edquist (1997) and Balzat (2002), “a national innovation system consists of organizations and institutions that influence each other in developing, absorbing and diffusing innovations in a country” (Balzat, 2002, p. 11; Edquist, 1997, p. 14). A bit of reflection suggests that AIS and AKIS are in some ways almost homologous in that they have similar values, although their structural orientation differs in that the AKIS highlights the institutions involved in promoting innovations for agricultural development while the AIS stresses the line of attack where innovation is needed, i.e., in the technical, managerial, commodity and institutional arenas.

What renders AIS distinct from previous systems is its emphasis on well established development approaches, such as value chain, market chain, and supply chain development strategies, with emphasis on high-value products and export markets. However, a criticism of the AIS system is the perceived lack of concern about environmental and social consequences. Figure 2 provides an operational view of institutional interconnectedness as conceived by the USAID-funded Agricultural Partnership, Productivity and Prosperity (AP3) program (USAID 2003). This model illustrates the multiple actors and the diversity of possible stakeholders in a dairy project in Kenya.

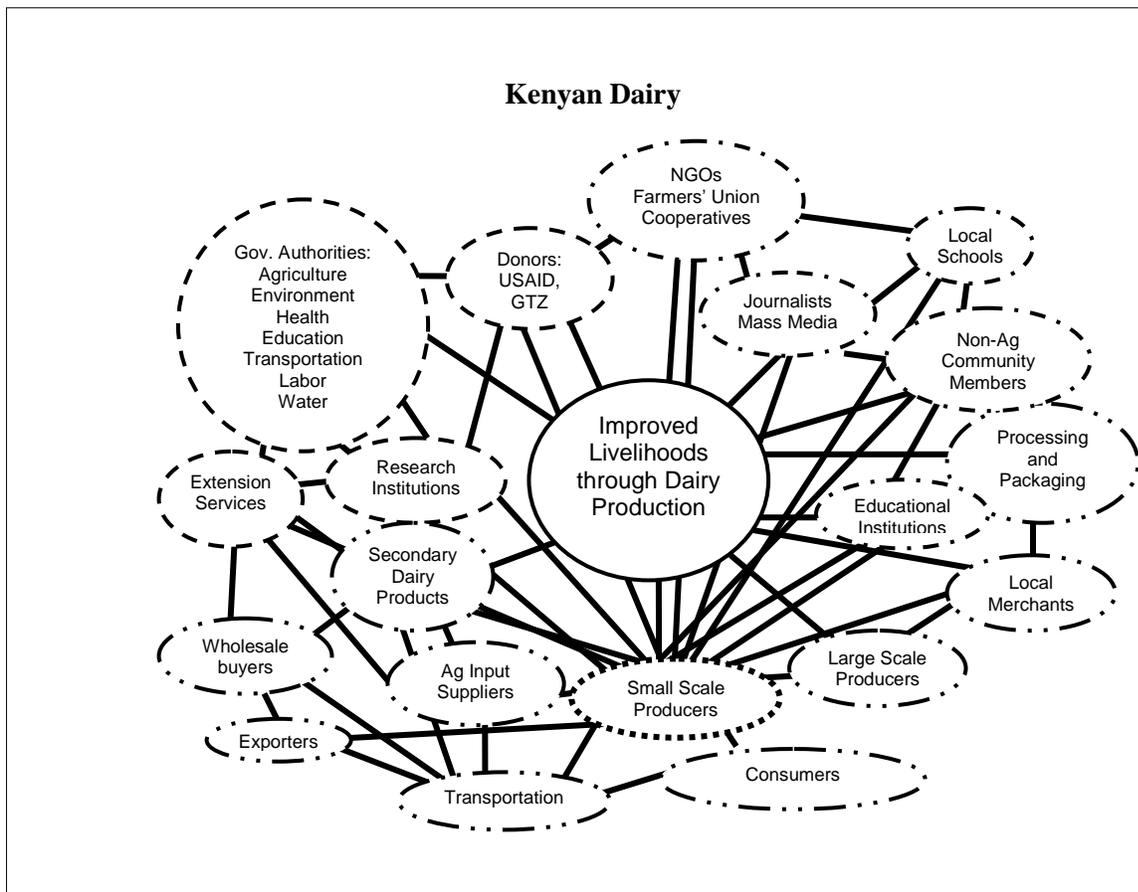


Figure 2. Mapping stakeholder relations: The Kenya dairy project. From “Agricultural Partnerships for Productivity and Prosperity (AP3),” presented at USAID, December 1, 2004.

This USAID strategy seeks to improve communications by involving all participants and potential stakeholders for a specific issue – in this case a commodity – and to bring them together to then to analyze jointly a potential situation and develop action plans to address that potential.

Figure 2 is a generic, or all-inclusive view of the institutions and organizations possibly involved in improving livelihoods through dairy production. Others (Mytelka, 2004) have provided explicit illustrations of connections and concerns in specific food industries, such as fish farming and viticulture. The gist of Figure 2, however, is the interconnectedness and the important interactions that need to be established among the various public, private and third-sector non-governmental and community-based actors in the development of

innovations in the production and processing of agricultural products.

At this point, I would like to suggest that in adopting an AIS perspective, we must be careful not to forget the importance of previous frameworks, and not “throw out the baby with the bath water,” so to speak. The three previous frameworks indicate certain truths that deserve to be remembered. For example, the NARI and the NARS are both concerned with capacity development and institution building. The AKIS framework promotes linkages among all actors in the knowledge system, including those in the public, private and third, or collective, sectors.

The World Bank has shifted its emphasis regarding AKIS/RD and regards this framework rather as a component of AIS. The AIS is therefore seen to encompass

these various frameworks and their distinct goals along with its emphasis on food chains, high-value products, and export markets.

In another illustration, Figure 3 illustrates the interconnectedness and the overlap of the four frameworks. Figure 3 is also intended to suggest that the different frameworks capture different perspectives and thus complement each other. Research and extension, capacity strengthening, system coordination, and the promotion of interconnectedness between public and commercial institutions to promote innovations – together these are fundamental elements of a comprehensive knowledge system.

Frameworks after all are just that: frameworks. The issue for countries, according to Mytelka (2004) is to recognize the need to change from being “technology producers” to becoming “technology users” and focus on building a “system of innovation” as opposed to a “system of production” with an understanding of development as a shift away from “traditional” sectors and toward “high tech” sectors.

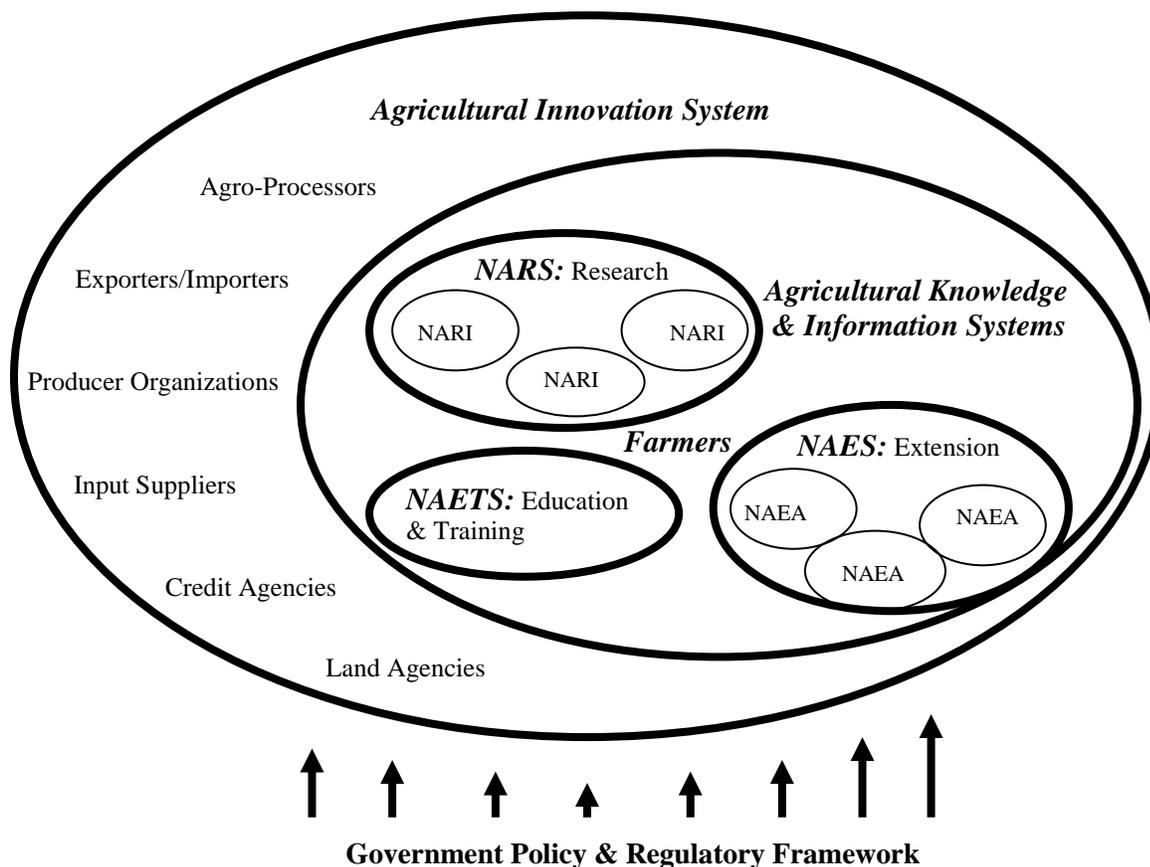


Figure 3. Overlapping frameworks. From “Enabling Agriculture: The Evolution and Promise of Agricultural Knowledge Framework,” by W. M. Rivera, G. Alex, J. Hanson, and R. Birner, 2006, *Proceedings of the 22<sup>nd</sup> Annual Conference of the Association for International Agricultural and Extension Education*, Clearwater Beach Florida, pp. 580-591.

Also, at the foot of Figure 3 is a reminder that despite the present emphasis on the role of the private sector in agricultural development, the role of government continues to be an important element in policy formulation and sector regulation in the advancement of agricultural knowledge.

Let us now turn to initiatives for developing innovation systems, with examples from Latin America.

### **Initiatives for Agricultural Innovation in Latin America**

A notable development is that the World Bank has shifted its direction from an AKIS portfolio to one emphasizing innovations. Its policies are increasingly aimed at promoting technological change in industry and agriculture. The Bank notes that in agriculture, the returns to its investments in agricultural research have generally been very good, with a minimum 175% return on investment; much of the success in meeting global good needs can be attributed to these investments (World Bank, 2005). “Still,” according to the Bank, “in many countries productivity of research programs is low. Despite increases in the availability of new knowledge and technologies, research systems do not necessarily increase the number of innovations reaching the farmer or the marketplace.”

The Bank argues that innovation systems must ultimately be demand-driven with closer linkages to clients, must become more efficient, and must develop sustainable sources of financing (World Bank, 2005). This shift by the Bank is toward a new way of thinking and acting in favor of agricultural research and development.

A glance at initiatives for agricultural innovations fall into diverse categories: technical, managerial, commodity and institutional. *Technical* innovations seek to promote new research or science as well as innovations in tools and processes for producing knowledge.

*Managerial* innovations aim to help producers improve their land and business efficiency and assets including those relevant to their performance and skills capacity. *Commodity* innovations focus on a particular commodity market and how to make it more profitable for farmers. *Institutional* innovations include initiatives by international organizations and countries seeking to implement new policies in existing organizations. These various initiatives often overlap, combining institutional and commodity initiatives with managerial and technical initiatives.

A number of international and national bodies have instituted programs either regionally or nationally to advance innovations systems. Examples of region-wide systems are Red SICTA in Central America and PROCIANDINO in the Andean countries. As for country-wide national bodies, prominent examples in Latin America are the Fundación para la Innovación Agraria (FIA) in Chile and of course Fundación Produce and COFUPRO in Mexico.

*Red SICTA.* The Red SICTA, run by the Swiss Agency for Development and Cooperation (SDC) in conjunction with the Inter-American Institute for Cooperation on Agriculture (IICA), focuses its efforts in Central America, financing innovative proposals by producers in conjunction with knowledge generating institutions, industry, and private and public institutions. Red SICTA supports mostly technological and commodity innovations, but also sponsors demand-driven innovation in farming technology and production systems.

*PROCIANDINO.* PROCIANDINO is a collaborative effort by IICA and the Inter-American Development Bank, the IDB. As the project name suggests, it works with member countries from the Andean Group. Member countries work to advance technology that has a potential for commercialization. PROCIANDINO supports mostly technological and managerial innovations, and their projects

tend to develop an industry-wide approach rather than a producer-oriented approach.

*Chile—Fundación para la innovación agraria (FIA).* FIA functions under the Chilean Ministry of Agriculture to promote innovation in agricultural activities through the Chilean nation. It produces and distributes information to producers, and is in charge of financing projects. A full listing of projects financed, by commodity, can be found in their website (<http://www.fia.cl/>). The main goal of FIA is to contribute to agricultural innovations so as to modernize and strengthen the Chilean rural economy. They employ technological and managerial innovations along with a demand-driven approach. In general, they tend to promote adoption of technologies developed elsewhere that might prove applicable to Chilean agriculture.

*Mexico—Innovative Research on Innovation.* A demand-driven agricultural development approach has been instituted in Mexico. Fundaciones Produce represents farmer commercial organizations. The Foundations operate in each of Mexico's 31 states, and are coordinated by COFUPRO, a partnership body established by the Government. One of the Fundaciones Produce has funded a mapping of the social network that emerged in their lemon agri-chain. They identified a group of farmers, and collected detailed technical and economic information on their adoption and use of innovations. With this information, they developed an "innovativeness index," which includes each farmer's propensity to innovate and his or her importance as a source of information for other farmers. They plan to use this experiment to change the way extension agents select their contacts. This is an interesting example of indigenous research issuing from a demand-drive approach to agriculture.

Now let's review: What have we learned from the preceding discussion of frameworks and initiatives for agricultural innovation?

1. That international national organizations and national states are shifting their strategies toward agricultural innovation and demand-driven approaches to development.
2. That nonetheless the AKIS/RD approach to knowledge system institutions continues to be viewed as an important component of AIS.
3. That countries need to change from being "technology producers" to becoming "technology users" with an understanding of development as a shift away from "traditional" sectors and toward "high tech" sectors
4. That initiating research into innovation practices is an important development if countries are to understand the best means of promoting the adoption innovations.
5. That demand-driven systems must be balanced by a national strategy that operates for the public good and responds to the problems of poverty as well as those of the environment.

Let us now turn to the question of what constitutes an innovative country?

### **Strategy, Alliances and Governance**

Within the context of the agricultural knowledge domain, I have already alluded to the need for research and extension, capacity strengthening, system coordination, and the promotion of interconnectedness between public and commercial institutions. Nonetheless, these elements are likely to occur only if the country itself is ready to learn from those inside and outside its boundaries. In a global marketplace where change is a constant, this means that a country must be ready to reconsider and possibly reform its institutions, commodity orientations, managerial processes and its technical traditions.

A favorable and responsive policy environment is crucial, especially one that supports the advancement of agricultural knowledge and is dedicated to fostering

agricultural and rural development. This means enacting a national policy or national agreement among its institutions and its people, to promote innovation.

*A national strategy.* A national strategy requires reform. And reform involves the implementation of institutional changes and new structures for supporting innovation. It also means implementing the necessary conditions for expressing demand for innovation. At issue is a continuing exploration of partnerships and networks to advance innovation, as figures 2 and 3 indicate. Finally, reform is inadequate without a financial base, and so an agenda is needed to secure long-term financing for innovation.

National reform means taking risks. In their examination of the impact of economic reforms on the performance of the agricultural sector in Latin America, economists Lederman and Soares (2001) point out that reforms tend to have the immediate effect of reducing productivity growth in agriculture. This reduction in productivity is recovered only after approximately three and one half years. However, after this period, productivity tends to grow at rates usually higher than the ones observed in the pre-reform period, compensating for the transition period of reduced growth. They note also that reforms on the average tend to be progressively intensified over time. Their conclusion supports taking the risk of reform.

*Aligning agricultural institutions.* A national strategy to promote agricultural innovation will likely be strengthened by adoption of the notion of an agricultural innovation system, or AIS. However, I hypothesize that AIS works best where an AKIS/RD system is functioning, where there is *strategic institutional alignment* among public, private and third sector agricultural knowledge and information institutions and organizations. As noted, strategic alignment operates when the entities in the agricultural knowledge system of institutions and organizations aim to accomplish specific

goals set down in a national innovation strategy, which means that these entities agree on the markets to be served, the financial and support capabilities required, and the programs needed to be developed. Of course, these specific strategic goals will be pursued in addition to the functions normal to their general mandate.

*Strategic Governance.* Underlying any set of guidelines and strategies is the condition that makes them operative: *strategic governance*. By that I mean *governance that operates with a view to responding to the demands of a national strategy and insists on results and accountability in line with that strategy while making sure that appropriate users and stakeholders are involved*. This should not imply that public sector institutions alone would provide all respective public goods and services. The private and the third sector need to be involved in various ways, such as through partnership arrangements, contracting and regulation. If one distinguishes between the provision and the financing of services, it becomes clear that there is a wide range of alternative institutional options. Indeed, a review of extension reform in more than 40 developing countries (Rivera & Alex, 2003) showed that the reform efforts of the past decade have indeed led to a wide variety of institutional arrangements involving the public sector, the private sector, NGOs and farmers' organizations.

Despite the call for pluralism and privatization, I believe it is important to be a bit of a contrarian, and to recognize once again the importance of the nation state. My reason for highlighting governance, and specifically strategic governance, is to argue that the neo-liberalism idea of free markets, free trade, and open economies is over developed. It was advanced in reaction to the welfare state, and tends to promote individuals against the state. Nevertheless neo-liberalism overlooks the fact that the state is still the crucial actor in development and in initiating national strategies that

incorporate new reforms and respond to the initiative of new frameworks. The often declared demise of the nation state is a myth. Government continues to play the crucial role in developing pluralistic, innovative systems (Rivera & Alex, 2004)

### Final Comment

So what makes one country more innovative than others? I suggest that it depends on creating a *national vision and strategy*, promoting *institutional alignment* around specific goals that nonetheless may (and probably will) change over time, and maintaining *strategic governance*. These elements flourish when they have their roots in a framework that aims to develop an innovation system.

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