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FROM "BEST PRACTICE" TO "BEST FIT":

A FRAMEWORK FOR ANALYZING PLURALISTIC AGRICULTURAL ADVISORY SERVICES WORLDWIDE

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ABSTRACT

The paper develops a framework for the design and analysis of pluralistic agricultural advisory services and reviews research methods from different disciplines that can be used when applying the framework. Agricultural advisory services are defined in the paper as the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies to improve their livelihoods and well-being. The paper is motivated by the revived interest in agricultural advisory services in developing countries, and by current reform trends that have led to pluralistic services. To classify pluralistic agricultural advisory services, the paper distinguishes between organizations from the public, the private and the third sector that can be involved in (a) providing and (b) financing of agricultural advisory services. The framework for analyzing pluralistic agricultural advisory services presented in the paper addresses the need for analytical approaches that help policy-makers to identify those reform options that best fit country-specific frame conditions. Thus, the paper supports a shift from a "one-size-fits-all" to a "best fit" approach in the reform of public services.

The analytical framework developed in the paper "disentangles" the major characteristics of agricultural advisory services on which policy decisions have to be made: (1) governance structures, (2) capacity, management and organization, and (3) advisory methods. The framework identifies four sets of frame conditions that need to be considered when deciding on these characteristics: the policy environment, the capacity of potential service providers, the type of farming systems and the market access of farm households; and the nature of the local communities, including their ability to cooperate. The framework suggests an impact chain approach to analyze the performance and the impact of agricultural advisory services. The farm households play a central role in the analytical framework as their interaction with the advisory services is critical to both performance and impact. The framework can be applied in a dynamic perspective to analyze processes of change over time.

Based on a review of the literature, the paper presents a variety of quantitative and qualitative methodological approaches derived from different disciplines that can be applied when using the framework in empirical research projects. The disciplines include agricultural and institutional economics, communication theory, adult education, and public administration and management. The paper intends to inform researchers as well as practitioners, policy-makers and development partners who are interested in supporting evidence-based reform of agricultural advisory services.

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I. INTRODUCTION

Agricultural advisory services are back on the development agenda (Nagel, 2003). In the 1960s and 70s, the development of agricultural advisory services – also referred to as agricultural extension - was seen as a major factor in promoting agricultural development. It is widely recognized that agricultural advisory services played an important role in launching the Green Revolution in Asia. However, the disenchantment with agriculture, especially in sub-Saharan Africa, and the structural adjustment policies of the 1980s and 90s led to a decline in national and international support for agricultural advisory services. Except for cases of highly-commercialized agriculture, where advisory services were often financed by farmers or farmers' groups, output buyers and input suppliers, advisory services for smallholders were almost exclusively a public sector activity. After the time of the Green Revolution, public sector advisory services suffered from a loss in stature caused by the widespread perception that they had become ineffective, inefficient, and fiscally unsustainable. In part, this loss of stature was related to a change of paradigm regarding the role of the state in development, which characterized the structural adjustment era. In part, the loss of stature of agricultural advisory services may also have resulted from the promotion of a rather uniform model—the Training and Visit (T&V) system—across some 50 countries until the mid 1990s.

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Often, T&V was inappropriate to the conditions of countries in which it was promoted, thus leading to disappointing results (Anderson, Feder and Ganguly, 2006).

The current interest in agricultural advisory services is emerging as part of a broader shift in thinking that focuses on enhancing the role of agriculture for pro-poor development. This shift emphasizes the continued need for agricultural advisory services as a means of promoting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture as an engine of pro-poor economic growth. Agricultural advisory services are also needed to meet the new challenges agriculture is confronted with: changes in the global food and agricultural system, including the rise of supermarkets and the growing importance of standards and labels; growth in non-farm rural employment and agribusiness; constraints imposed by HIV/AIDS, and other health challenges that affect rural livelihoods; and the deterioration of the natural resource base and climate change.

Informed by market-led and demand-driven perspectives, national and international efforts to revitalize agricultural advisory services have resulted in a variety of institutional reforms (Rivera and Alex, 2005): Decentralization, deconcentration, contracting/outsourcing, public-private partnerships, and privatization have started to transform conventional models of public sector agricultural advisory services. Revitalizing public sector advisory services has also been an important reform strategy. In addition, new actors have entered the scene to provide and finance advisory services, including non-governmental organizations (NGOs), farmer organizations and community-based organizations. Private sector companies provide embedded advisory services, which are integrated in commercial transactions such as sale of inputs or contract farming (Katz, 2006). Innovative advisory methods have gained ground, such as group-based and participatory approaches. The availability of information and communication technologies (ICTs) offers a range of new opportunities for providing advisory services. The term “pluralistic” has been coined to capture the emerging diversity of institutional options in providing and financing agricultural advisory services.

Table A1 in Annex 1 gives an overview of the variety of international reform efforts in different parts of the world (Rivera and Alex, 2005).

The emerging pluralistic systems offer new options to meet the challenges inherent in providing agricultural advisory services: the scale, scope, and complexity of advisory activities caused by the nature of agricultural production; the associated problems of monitoring, evaluation and impact assessment; the complexity of interactions between advisory services and national and international agricultural research systems; the challenge to promote learning processes and establish feedback linkages; the need to address public concerns, such as environmental concerns, which go beyond agricultural knowledge and information transfer; the problem to ensure political commitment and fiscal accountability; and the influence of the wider policy environment and political economy (compare Feder, Willet and Zijp, 2002; Anderson and Feder, 2004). The emergence of pluralistic systems also addresses the challenges related to the financing and delivery of advisory services that are best suited to country-specific frame conditions, product- or commodity-specific needs, and political or economic priorities.

Even though there is increasing case study evidence on different reform strategies for agricultural advisory services (Rivera and Alex, 2005; Rivera and Zijp, 2002; Katz, 2002), there is still a considerable lack of analytical tools and empirical evidence to guide the choice of reform options in a particular country. As Anderson and Feder (forthcoming) conclude in their review of agricultural advisory services:

> "Understanding of what works well in the diverse circumstances of the developing world is still far from complete and there is thus a clear need for continuing research effort to fill these gaps."

The present paper develops an analytical framework that aims at supporting the reform of agricultural advisory services (1) by informing the design and management of these services and (2) by guiding applied research in this field. The paper also aims at supporting the reform of agricultural advisory services by identifying non-traditional institutional arrangements, assessing different reform options *ex-ante*, supporting

experimentation and learning in ongoing reform processes, and analyzing past reform experiences. Considering the complexity of agricultural advisory services, the framework integrates analytical contributions offered by different disciplines—agricultural and institutional economics, communication theory, adult education, and public administration and management.

The paper is motivated by the insight that promoting "one-size-fits-all" approaches are inappropriate for agricultural advisory services. The experience, especially with the T&V system, shows that it is not a promising strategy to import standardized models of advisory services that have worked elsewhere even if they are viewed as "best practice". What is important is to build capacity among policy-planners, managers and researchers to identify modes of providing and financing advisory services that "best fit" the specific conditions and development priorities of their country (compare Eicher, 2004). This perspective is strongly supported by the experience of general public sector management reforms in developing countries (Levy and Kpundeh, 2004).

The paper intends to inform three major audiences: (1) researchers and students who are interested in analyzing research on agricultural advisory services with the aim to support evidence-based reforms in this field; (2) managers of agricultural advisory services, policy-makers, consultants, development partners and financial institutions that involved in the reform of agricultural advisory services; and (3) development professionals from other fields who consider the case of agricultural advisory services as an example of reforming rural services.

Considering that rural households operating small-scale farms constitute the majority of the rural poor worldwide, this paper focuses on providing agricultural advisory services to small-scale farm households, taking into account that both men and women are involved in agricultural production. The analytical approach proposed here can also be applied to other types of advisory services, including advisory services for commercial farm enterprises. From a poverty reduction perspective, two other types of advisory services, to which the framework can be applied, are of particular interest: (1)

Home economics advisory services: These services focus on the domestic and reproductive role of women and may cover nutrition, child care and home management as well as income-generating skills for women. Considering that child malnutrition remains wide-spread even in households that are not poor, advisory services focusing on child nutrition deserve special attention.[2] (2) Business enterprise development services: In the course of the agricultural transformation, an increasing number of rural people have to move from agriculture to off-farm activities. Advisory services that address the knowledge needs of rural non-farm enterprises can play an important role in responding to this transition. With some modifications, the analytical framework proposed here may also be applied to other types of economic and social services in rural areas, such as community health services and financial services.

The paper is organized as follows: Section 2 sets forth basic terms and concepts. Section 3 describes the framework for designing and analyzing agricultural advisory services. Section 4 discusses research methods for the different components of the framework. Section 5 concludes with some reflections on the application of the framework.

[2] Nearly a third of all pre-school children in developing coutries are stunted by undernutrition (Gillespie, McLachlan and Shrimption, 2003).

II. DEFINITIONS AND CONCEPTS

Defining Agricultural Advisory Services

The term "agricultural advisory services" has evolved from the term "agricultural extension." There are many definitions, philosophies, and approaches to agricultural advisory services. Although agricultural advisory services have roots as far back as 1800 B.C., formal practices began in the late 1800s A.D. The first modern agricultural advisory service was established in Ireland during the potato famine in 1845 (Swanson et al., 1997). In many developing countries, commodity-oriented technical advice was provided during colonial times to farmers producing commercial crops, but national agricultural advisory services were not formally established until the 1950s and 60s. As originally conceived, these services were designed to bring new knowledge and techniques from public research organizations to a broader spectrum of farmers (Purcell and Anderson, 1997).

While the goals of agricultural advisory services are much the same as when they were introduced, their scope and definition have changed much over the past decades. Agricultural advisory services in developing countries today have assumed a much more holistic and facilitatory role, and the field staff of an agricultural advisory service is not just a conduit of information, but an advisor, facilitator, and knowledge broker (Alex et al., 2002). The purpose of agricultural advisory services has also broadened in recognition of the need to go beyond merely providing technical solutions to look more broadly at the institutional environment in which technologies are developed and disseminated. Today's understanding of advisory services goes beyond training and sending messages, and includes assisting farmers to organize and act collectively, addressing processing and marketing issues, and partnering with a broad range of service providers and rural institutions. Farmers are seen as partners in the technology generation process, rather than as simply recipients of technology. As indicated in the introduction, the range of organizations providing advisory services also increased, including public sector agencies as well as non-governmental organizations and the private sector.

Against this background, agricultural advisory services are defined in this paper as the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being.

Pluralistic Agricultural Advisory Services

This paper concentrates on pluralistic agricultural advisory services. As indicated in the introduction, the term "pluralistic" advisory services refers to the coexistence of a variety of institutional options that exist for financing and providing agricultural advisory services. The term "governance structures" is used in this paper to refer to these institutional options. Pluralistic advisory services can help to overcome constraints such as funding and personnel shortages, and provide a strategy for tailoring services to the needs of specific sub-sectors or regions. Pluralistic advisory services are also seen as a way of ensuring greater stakeholder involvement. One of the aspects of pluralistic advisory systems is the use of partnerships and other types of collaboration between players, with the recognition that different players may have comparative advantages for different functions (compare Crowder, 1996). In pluralistic advisory services, the state can take on the role of facilitator for the many other actors involved in advisory services—such as non-governmental organizations, farmers' groups and private advisory services (Gautam, 2000; McMillan, Hussain and Sanders, 2001; van den Ban, 2000).

To classify pluralistic advisory services, it is useful to distinguish three sectors that may be involved in financing and providing agricultural advisory services: (1) the public sector (public administration, state agencies), (2) the private sector (farm households, agribusiness enterprises, other profit-oriented firms), and (3) the third sector (non-governmental and non-profit organizations, farmers' organizations, civil society organizations). Institutional structures that are composed of organizations from different sectors may be referred to as "hybrid" (Williamson, 1986). Table 1 displays the variety of options that exist for financing and providing advisory services, if one takes the role of different sectors into account.

Table 1. Options for Providing and Financing Pluralistic Agricultural Advisory Services

	Source of Finance for the Service				
Provider of the service	**Public sector**	**Private sector: Farmers**	**Private sector: Companies**	**Third sector: NGOs**	**Third sector: FBOs**
Public sector:	(1) Public sector advisory services (different degrees of decentralization)	(5) Fee-based public sector advisory services	(9) Private companies contract staff from public sector advisory services	(12) NGOs contract staff from public sector advisory services	(16) FBOs contract staff from public sector advisory services
Private sector: Companies	(2) Publicly funded contracts to private service providers	(6) Private sector companies provide fee-based advisory services	(10) Embedded services: Companies provide information with input sale or marketing of products	(13) NGOs contract staff from private service providers	(17) FBOs contract staff from private service providers
Third sector: Non-governmental organizations - NGOs	(3) Publicly funded contracts to NGO providers	(7) Advisory services agents hired by NGO, farmers pay fees	(11) Private companies contract NGO staff to provide advisory services	(14) NGOs hire own advisory staff and provide services free of charge	
Third sector: Farmer-based organizations (FBOs)	(4) Publicly funded contracts to FBO providers	(8) Advisory service staff hired by FBO, farmers pay fees		(15) NGO fund advisory service staff who are employed by FBO	(18) FBOs hire own advisory staff and provide services free to members

***Source**: Adapted from Rivera (1996) and Anderson and Feder (2004: 44).*

Table 1 still does not capture the entire range of options for providing and financing agricultural advisory services. Within the public sector, there is a variety of options regarding the degree of decentralization. Moreover, decentralization can take many forms, such as *deconcentration* (accountability remains within the Department of Agriculture), *devolution* to local governments (accountability to locally elected governments) or *delegation* to semi-autonomous agencies. The Table also does not capture the variety of decision-making arrangements that are possible in hybrid governance structures. For example, advisory services may be financed by a public fund,

but the decision on how the resources of this fund are allocated is made by farmers' organizations, or jointly by farmers' organization and public officials. The Fundaciones Produce in Mexico are an example. There are also public-private partnership models, where a private company and a public agency jointly finance and provide advisory services, as in Madhya Pradesh, India (Sulaiman, 2003). The picture can be further differentiated by considering the modalities of financing services. Financing advisory services by competitive grants is, for example, a widely used strategy in Latin America. Last, but not least, one could add the farmers as providers of agricultural advice to their peers.[3]

Reform strategies for agricultural advisory services can be analyzed as moves between different cells of Table 1. For example, the full privatization of a public sector advisory system is represented by a move from cell (1) to cell (6), whereas reform strategies that involve contracting out are represented by moves from cell (1) to cells (2), (3) or (4). As Table A1 in Annex 1 shows, a considerable variety of different reform strategies has, in fact, already been implemented in different countries. A general reform trend can be seen in moving away from pure public sector models of providing and financing advisory services towards contracting out or privatization (compare Neuchâtel Group, 2000; 2006; Rivera and Zijp, 2002). However, Latin American countries that already abolished public sector advisory services in the 1980s and 90s are now considering re-establishing public sector models for small-scale farmers. Changes in the agricultural and food system have also led to the emergence of new types of agricultural advisory services, for example embedded services, which operate largely outside conventional agricultural and service policies.

Next to the concept of pluralistic agricultural advisory services, the concept of "demand-driven agricultural advisory services" has gained importance in the current reform debate. A strategy document of the Neuchâtel Initiative – an international donor-

[3] A recent representative survey in India, for example, reconfirmed that progressive farmers are more important as a source of information than any other public, private or third sector provider of agricultural advice. Moreover, advice from progressive farmers led to a higher adoption of recommended practices than advice from other any other source (Bhalla, 2006).

forum on agricultural advisory services – defined demand in this context as "what people ask for, need and value so much that they are willing to invest their resources, such as time and money, in order to receive the services." (Neuchâtel Group, 2006: 3). As emphasized by the Neuchâtel Initiative, demand-driven services are characterized by accountability of service providers to the users, and by the ability of farmers to choose freely among service providers. A concern with the concept of demand-driven advisory services is that it might be too narrow, because farmers are not always aware of new technologies that they could demand. Many important innovations (fresh fruits and vegetables in Israel, Mexico and Central America, kiwis in New Zealand, and the Green Revolution) were in fact "supply"-driven. Hence, the term "needs and opportunities driven" may be more appropriate.

Agricultural Advisory Services as a Component of the Agricultural Knowledge/ Innovation System

To understand the contribution of advisory services to agricultural development, it is essential to consider these services as part of a wider system of knowledge generation, exchange, and use in the agricultural sector. Röling (1990:1) captures these concepts in his description of an agricultural knowledge and information system (AKIS) as "a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in such processes as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision-making, problem solving and innovation in a given country's agriculture or domain thereof."

Applying this concept, agricultural advisory services have been conceptualized as one of the three pillars of an "Agricultural Knowledge and Information System for Rural Development" (AKIS/RD) alongside agricultural research and agricultural education and training (FAO/World Bank, 2000). The concept of AKIS/RD emphasizes the need to foster the feedback linkages between agricultural advisory services, research and

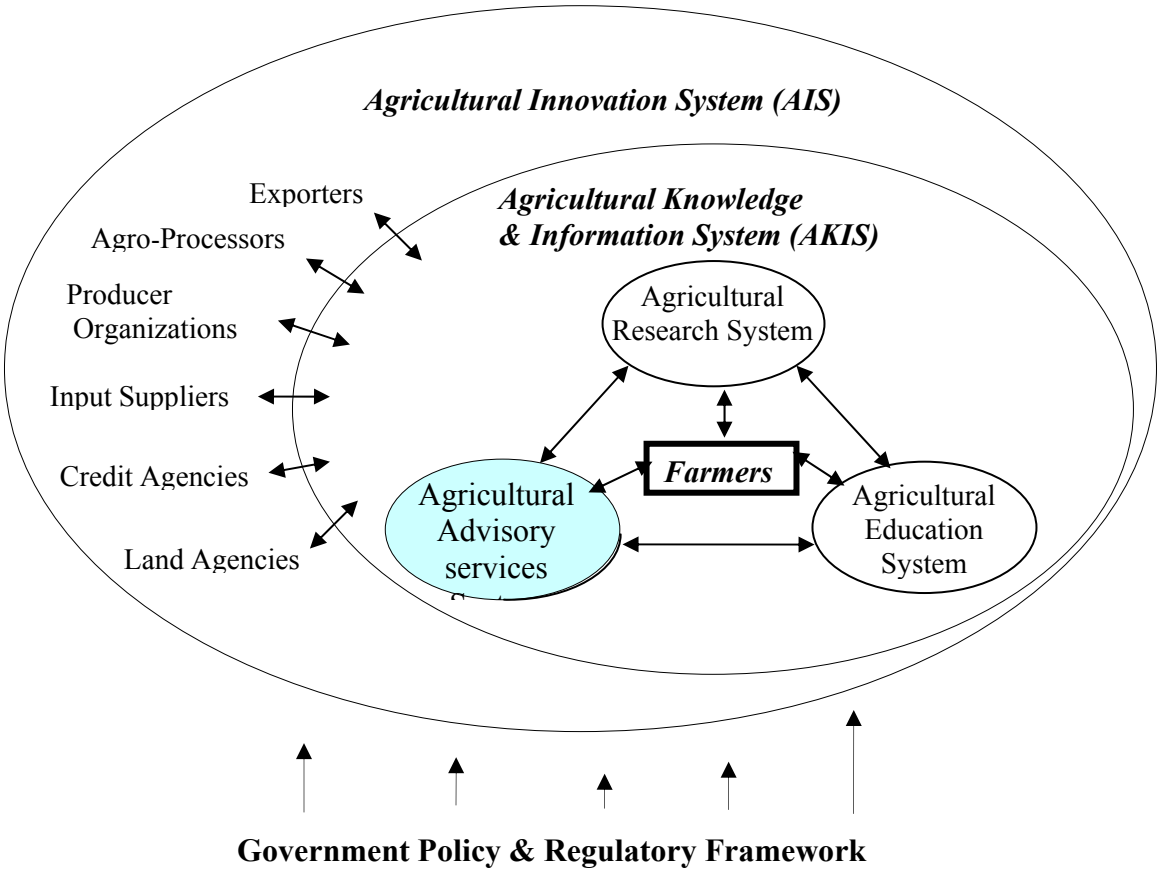
education.[4] It has been widely used by the World Bank, FAO and other organizations to guide policy planning and investment in these three areas (see Rivera, Qamar and Mwandemere, 2005 for a review).

Agricultural advisory services can also be considered as a component of an "Agricultural Innovation System" (AIS). AIS is based on the "National System of Innovation" (NIS) concept, which is widely used to guide science and technology policy in OECD countries. The NIS concept was first developed in evolutionary economics and emphasizes the role of a wide range of factors that influence innovative activity and innovative performance in an economy (see review by Balzat and Hanusch, 2004). Next to investments in research, such factors include, for example, human resources development and the climate for entrepreneurial behavior. Applications of the NIS concept to the agricultural sector in developing countries emphasize the role of partnerships among a wide range of stakeholders beyond agricultural research, agricultural advisory services and agricultural education (Clark, 2002; Hall et al., 2004; Spielman, 2005). Other partners in an AIS include, for example, input suppliers, processors, export companies, non-governmental organizations and the media, which may all be involved in the development of innovations in the agricultural and food system. Due to changes in the global agricultural and food system caused by factors such as the increasing demand for high-value products and the rise of supermarkets, the role of agribusiness enterprises and other private sector actors in the agricultural innovation system deserves special attention. Considering this wider range of stakeholders, an AKIS/RD can be considered as a sub-system of an AIS, as illustrated in Figure 1.

Both the AKIS/RD and the AIS concepts reject a linear vision of science that emphasizes the creation of information that is new to the world and then "transferred" to economic agents. From an AKIS and an AIS perspective, the role of agricultural advisory services is to help economic and social agents to develop individual and social skills to

[4] One has to acknowledge that the boundaries between agricultural research, advisory services and education are not always clear-cut. For example, participatory advisory services contain elements of adult education and action research, whereas participatory agricultural research contains elements of advisory services and agricultural education.

better identify their constraints or emerging opportunities, to design strategies to address them and to act according to these strategies. The following analytical framework acknowledges that agricultural advisory services are part of a wider knowledge and innovation system, and pays due attention to the linkages between advisory services and other components of AKIS/AIS.[5] However, its primary purpose is to "zoom in" on agricultural advisory services in order to guide research that deals specifically with this component.



***Source**: Adapted from Rivera et al. (2006).*

Figure 1. Agricultural Advisory Services as Component of an Agricultural Knowledge and Innovation System

[5] An analytical framework that focuses on the agricultural research system or the agricultural education and training system may have similar components than the framework proposed here. Comprehensive research projects may deal in detail with all three systems at the same time.

III. ANALYTICAL FRAMEWORK

Purpose of the Framework

The analytical framework presented here can be used for two major purposes:

- ***To assist in the design and reform of agricultural advisory services***: The framework identifies the different characteristics of agricultural advisory service systems, on which policy decisions have to be made, and the frame conditions to be taken into account when making these decisions. Hence, the framework can support the planning of investments in agricultural advisory services and guide their reform. The framework also deals with the performance and impact of agricultural advisory services, hence it can be used to guide the establishment of monitoring and evaluation systems for investments and reforms in agricultural advisory services. The framework may be used at the national level when developing policies for an entire system of pluralistic agricultural advisory services, or it may be used for the design and planning of a specific advisory service.
- ***To guide applied research on agricultural advisory services:*** The framework can also be used to make the findings of different research projects comparable, thus improving the understanding of the role and operation of advisory services and creating more evidence in support of reform. A common analytical framework allows researchers to create synergies by combining the approaches used by different disciplines, which are useful to analyze the various dimensions of agricultural advisory services. Bringing the perspectives of different disciplines together in order to generate policy-relevant knowledge on the reform of agricultural advisory services is a major rationale of developing this framework. The framework can be applied to the analysis of advisory services at the national and sub-national level, and it can be used for cross-country comparisons. Hence, the framework is expected to be useful for guiding different types of research projects, including
    - Research projects that aim at analyzing different dimensions of pluralistic agricultural advisory services at the national level in an integrated way;

- Research projects that focus on the sub-national level and (a) compare advisory services provided by different organizations (e.g., public and private providers), and/or (b) compare advisory services provided by the same organization in different regions or districts; and
- Research projects that aim at comparing agricultural advisory systems—or components thereof—across different countries.

This paper does not only present the analytical framework, it also reviews the relevant literature and discusses research methods that can be used to analyze different components of the framework (Chapter 4). Individual research projects may not cover all the components included by the framework, but the framework can help to promote synergies among research projects that focus on different components. Likewise, using a common framework has the potential to promote synergies among research projects conducted by different teams in different countries. The framework presented here should be understood as a starting point, and research teams may adjust it according to their needs and experiences.

Description of the Framework

Overview

From a policy perspective, it is important to distinguish between the variables that policymakers and advisory services managers can influence directly (choice variables), and those variables that they can influence only indirectly or that are beyond their influence (frame conditions). The characteristics of agricultural advisory services – their governance structures, capacity, organization and management and advisory methods - are choice variables. They are displayed in Boxes G, M and A in Figure 1.[6] The frame conditions, which have to be taken into account when making choices on the design of

[6] In principle, the characteristics of the agricultural research system and the agricultural education system, and their linkages with agricultural advisory services, are also choice variables. As in case of agricultural advisory services, reforming these systems requires a political process that may take time. Since this framework focuses on the agricultural advisory services component of the knowledge and innovation system, the characteristics of agricultural research and education are not captured at the same level of detail in Figure 2.

advisory services, are displayed in Boxes E, S, F and C. The following description of the framework starts with the characteristics of advisory services (second group of boxes in Figure 2), followed by the frame conditions (first group of boxes). The description then continues with Boxes P, H and I, which are placed on the right-hand side of the group of boxes describing the characteristics of advisory services. Boxes P and I deal with the performance and impact of advisory services. The box referring to the farm households (Box H) has central importance in the framework as it is relevant both for the design of agricultural advisory services (establishing mechanisms for voice and accountability) as well as for their impact (without changes at the farm household level, no impact will occur). Hence, this box is referred to at several points in the description of the framework.

Characteristics of Agricultural Advisory Services

As explained in Section 2.2, the **governance structures (Box G)** variables refer to institutional set-up of agricultural advisory services. As has been discussed in Section 2.2, there is a wide variety of possible governance structures, considering the role that organizations from the public, the private and the third sector can play in providing and financing agricultural advisory services. The choice of governance structures is of fundamental importance in the design and reform of agricultural advisory services. Policy-makers can directly decide on the characteristics of advisory services that are publicly financed. They can also create enabling conditions for the emergence of advisory services that are financed and managed by the private or the third sector (farmers' organizations, agri-business enterprises, etc.)

The **capacity, management and organization (Box M)** variables refer to the capacity for the provision of advisory services, and way in which the services are managed within the respective governance structures. To use a common paraphrase, the governance structures refer to the "rules of the game," while the capacity, management and organization box refers to the "players" of the game, their abilities, and the way they play. Box M captures the numbers, training levels, skills, attitudes, motivation and

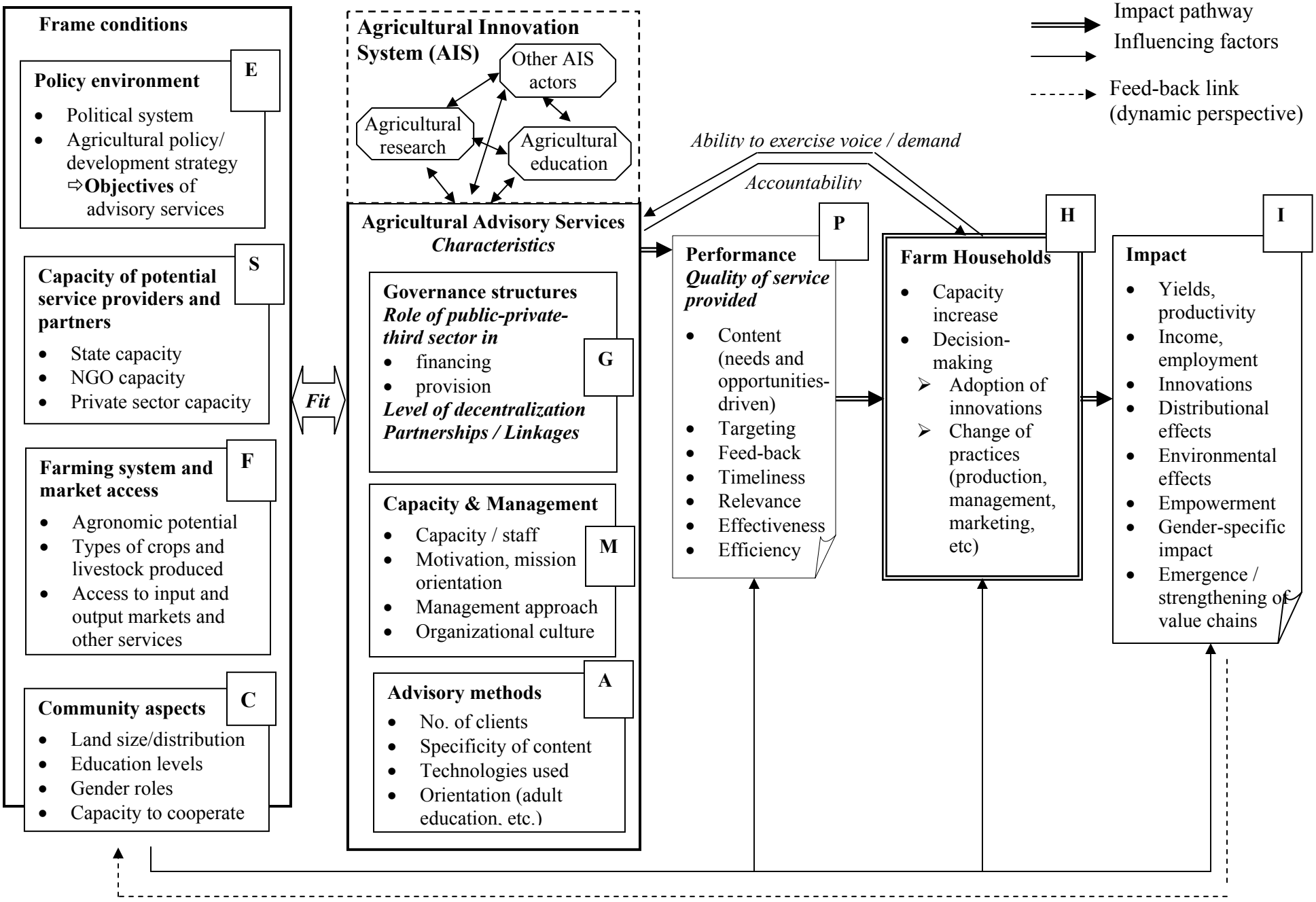


Figure 2. Framework for Designing and Analyzing Agricultural Advisory Services

aspirations of the staff members of the advisory service, their incentives, mission orientation, professional ethics and organizational culture. It also captures the management procedures applied, such as the monitoring and evaluation systems and performance management systems. Feed-back from farmers can be an important management instrument, as the link between characteristics of advisory services and households in Figure 2 indicates.

Box A refers to the **advisory methods** that are used by the field staff of agricultural advisory services in their interaction with farmers. As further detailed in Section 4.3, advisory methods can be classified according to various aspects, such as the number of clientele involved (individuals, groups); the types of decisions on which advice is provided (specific to the production of certain crops or livestock; managerial decisions; group activities, etc.); and the media used (radio; internet, etc.).

By distinguishing governance structures, capacity, management and organization and advisory techniques, the analytical framework places emphasis on "***disentangling***" agricultural advisory services. "Disentangling" these elements is of special importance for identifying "best fit" solutions. Past impact assessment studies often left it unclear whether investments in agricultural advisory services had limited impact because the advisory methods applied were inappropriate, the training level of the advisory services agents was too low, the system was not managed well, the system was too centralized, etc.

As indicated by the arrows in Figure 2, the ability of **farm households/clients (Box H)** to exercise voice and formulate demand is an important aspect of an agricultural advisory service. This ability is influenced both by the characteristics of the farm households and by the characteristics of the advisory service. For example, a decentralized governance structure, a favorable advisory staff to farmer ratio, a responsive management approach, and the use of participatory advisory methods are all factors that improve the possibilities of farm households to exercise voice and hold the service providers accountable.

Factors that Influence "Best Fit"

Applying a "best fit" perspective, the choice of the characteristics of an advisory service should depend on the frame conditions as they determine which systems are most appropriate for a given situation. Though we adopted the phrase "from best practice to best fit" from the public sector management reform literature, the proposed analytical approach does not assume that there is one single optimal or best model, which can be identified, if all the frame conditions are known. It is acknowledged that there are always different ***options*** available which can work well, and their choice is influenced by political feasibility and value judgments regarding the trade-offs involved.

The **policy environment (Box E)** for agricultural advisory services is an important frame condition. In particular, the political priorities of a country and its agricultural development strategy have far-reaching implications for the appropriateness of different models of providing and financing agricultural advisory services. The proportion of the budget that a government is able and willing to spend on the agricultural sector determines the scope for publicly funded advisory services. Priorities within the agricultural sector play an important role, too. Agricultural development strategies that focus on high-value agriculture require other models of agricultural advisory services than strategies focusing on the promotion of food-staple crops. Likewise, the relative priority placed by governments or other providers on different goals, including economic growth, social inclusion and environmental sustainability, will influence the type of advisory services that are most appropriate. When analyzing the objectives of advisory services, one has to keep in mind that governments may pursue other objectives than the officially stated ones. For example, creating a channel to exercise political influence in rural areas may be an underlying motivation for governments to invest in advisory services.

In order to determine appropriate governance structures, the **capacity of potential service providers (Box S)** is also an important frame condition. If the country under consideration has a relatively effective public administration system, the public sector may have a higher comparative advantage in providing respective services than in

situations where the public administration is generally weak, but NGOs are strong (Section 4.1.1). Whether the private sector is interested in playing a role depends largely on the economic opportunities.

The types of **farming systems** and the degree of **market access (Box F)** are also important frame conditions for the design of an agricultural advisory service. The opportunities and needs for agricultural advice differ considerably, depending on the type, intensity and diversity of the crops and livestock farmers produce, and on farmers' access to input and output markets and other services. These factors are, in turn, influenced by the agro-ecological and infrastructural conditions of the respective region. The need of an agricultural advisory service to address environmental and natural resource management concerns also depends on the agro-ecological conditions.

Last, but not least, the **characteristics of the local communities (Box C)** play an important role of the design of an agricultural advisory service. Heterogeneity in terms of land holdings and assets, ethnicity, education and other factors influences the capacity of farm households to cooperate and to form organizations. This organizational capacity, also referred to as social capital, is an important frame condition for the choice of advisory methods. Socially determined gender roles influence the strategies that advisory services systems need to apply in order to reach women farmers. Likewise, the prevalence of social hierarchies and social exclusion influence the strategies required to reach disadvantaged groups.

Performance and Impact

Boxes P, H and I can be interpreted as an impact chain (compare Anandajayasekeram and Martella; Meredia et. al, 2000). Accordingly, the performance indicators (Box P) refer to the quality the "outputs" of an advisory service, which then lead to "immediate outcomes" – changes in farmers' behavior (Box H) and to "intermediate outcomes" (benefits at the farm household level) as well as "ultimate outcome impact" – contribution to broader societal goals (Box I).

Indicators of **performance (Box P)** that capture the quality of advisory services may include (1) the accuracy and relevance of the contents of the advice, (2) the timeliness and outreach of the advice, including the ability to reach women and disadvantaged groups, (3) the quality of the partnerships established and the feed-back effects created, (4) the efficiency of service delivery, and other economic performance indicators. The relative importance of these indicators depends on the policy objectives, and there may be trade-offs among them. Hence, it will be useful to discuss the indicators to be analyzed with policy-makers and stakeholders. From an analytical perspective, measuring and explaining performance involves less attribution problems than assessing the impact (Section 4.5). Still, performance indicators are most useful if they include information provided by the clients, even though this involves considerable data collection efforts. As indicated in Figure 2, performance is explained in this analytical framework as a function of (1) the characteristics of an advisory service and its linkages with research and education, (2) the frame conditions, and the "fit" of the service with the frame conditions, and (3) the ability of the farm households/clients to exercise voice and hold the providers of agricultural advisory services accountable.

From a policy perspective, the ultimate criterion for assessing agricultural advisory services is their **impact (Box I)** with regard to the policy objectives that the advisory services were set up to achieve. Obviously, the impact depends on the interaction between the farm households (Box H) and the advisory service. As indicated in Figure 2, an impact can only be achieved if the advisory services have an influence on decision-making at the farm household level and lead to a change of existing practices, for example, by increasing the farmers' capacity for problem solving, by promoting the adoption of new technologies, by improving farm management and marketing and/or by fostering innovative behavior.

As in the case of the performance indicators, the indicators used to measure impact depend on the societal objectives to which the advisory services are expected to contribute, such as poverty reduction, economic growth and environmental sustainability, empowerment and promotion of innovations. As there may be trade-offs between the

different objectives, it is important to generate empirical evidence on the extent to which different approaches to providing and financing advisory services serve these objectives, and how a pro-poor impact can be achieved. As in the case of performance indicators, discussions with stakeholders and policy-makers at the beginning of the reform process or, respectively, at the beginning of the research project, may be useful to identify the range of objectives as well as possible indicators that should be considered in impact assessment studies. The methodological challenges of impact assessment are further discussed in Section 4.5.

Dynamic Perspective

Applying a dynamic perspective, one has to take into account the fact that the frame conditions change over time, due to various factors such as general macro-economic development and macro-political change, specific policy interventions (e.g., investment in infrastructure), and unintended effects (e.g., climate change and natural resource degradation). Importantly, providing agricultural advisory services is itself a policy intervention that aims at changing the frame conditions. Hence, as indicated in Figure 2, there is a feed-back link between the impact of agricultural advisory services and the frame conditions. If the framework is used in a dynamic perspective, one also has to take into account the *process* of change, which has an important political dimension. This question is dealt with in Section 4.7.

IV. RESEARCH APPROACHES

This section discusses approaches for empirical research that can be applied to analyze pluralistic agricultural advisory services, using the framework presented in the last section. We refer to selected studies to illustrate research approaches that have been used and make suggestions on strategies for future research to address existing knowledge gaps. The framework and the research approaches presented here may be applied to analyze an entire system of agricultural advisory services, or concentrate on selected providers, sub-sectors, geographic regions, or administrative levels.

Analyzing the "Fit" of Governance Structures

This subsection deals with the factors that influence the appropriateness of different governance structures for agricultural advisory services, depending on the frame conditions (links between Box G and Boxes E, S, F and C in Figure 2).

Identifying Factors that Influence the "Fit" of Governance Structures

The literature dealing with the appropriateness of different governance structures for agricultural advisory services has largely been influenced by concepts of welfare economics and New Institutional Economics. Four factors have been highlighted in this literature (Umali-Deininger, 2005 for a recent review): (1) the degree to which the agricultural information and technologies to be promoted have the characteristics of private goods, public goods, toll goods or common-pool goods (Table A2 in Annex 1); (2) the possibilities of monitoring the service, (3) the degree to which the issues to be dealt with are of national or of local/heterogeneous nature, and (4) the possibility of achieving cost-recovery without excluding the poor from the service. Recommendations can be derived from these considerations by formulating "rules," such as: "Information closely associated with market goods (e.g., purchased inputs) is generally best left to the private sector" (Picciotto and Anderson, 1997). Another approach is to use decision-trees in order to formulate rules for different combinations of characteristics (Umali-Deininger,

2005). While useful, "rule-based" approaches have limitations in coping with the variety of specific conditions that influence the choice of governance-structure at the same time.

One approach to address this challenge is using transaction costs economics to identify appropriate governance structures (Williamson, 1985; Birner and Wittmer, 2004). According to Williamson's "discriminating alignment hypothesis," transactions that differ in their attributes are to be aligned with governance structures that differ in their costs and competence, so as to effect an economizing result. This approach represents a cost-effectiveness analysis, which makes it possible to compare governance structures in terms of the costs incurred for achieving certain objectives, such as delivering advice of a certain quality to a defined group of clients. In this type of cost-effectiveness analysis, it is important to compare the costs of providing advisory services against a *defined set of objectives* to avoid favoring governance structures that provide services at lower costs but do not reach the poor. The proposed analysis proceeds in the following steps:

1) Identifying the key attributes of providing advisory services

The comparative advantage of different governance structures depends on the transactions and their attributes, as well as on contextual factors. The transactions in case of agricultural advisory services may include transferring knowledge from different sources, including the research system, to the farmers and getting their feedback, building capacity through different forms of training and education, facilitating group processes, as well as planning, monitoring and evaluation activities. In industrial organization, important attributes of transactions, which determine the governance structures to be chosen, are *frequency*, *uncertainty* and *specificity* (Williamson, 1985). *Specificity* in agricultural advisory services refers to the extent to which advice is site-specific and client specific. The transferability of a technology is related to this attribute. As the above considerations show, additional attributes that are relevant in advisory services include the following:

- *Externalities* and *public good character* (see above) of the transactions: Since these characteristics lead to market failures, they are important criteria and influence the need of the public sector to be involved in the respective governance structure.
- *Measurability* of the quality of the transaction: This is a considerable challenge in agricultural advisory services. The quality of advice given to farmers is difficult to measure by a third party, because the ultimate result (e.g., increased yield) is influenced by a number of other factors. If the experience of the farmer with the particular technology is limited, even the farmers themselves may have difficulties to judge the technical content of the service provided.

Further research on the "best fit" of governance structures may throw light on other attributes of the activities of agricultural advisory services to be considered in selecting appropriate governance structures.

2) Identifying contextual factors

The choice of appropriate governance structures obviously depends on the frame conditions. The complexity of the agricultural system and the education level of the farmers are important frame conditions (Boxes F and C in Figure 2). The capacity of the potential organizations to be involved is an important frame condition, too. For example, if local communities have a high level of social capital (dense social networks, trust, sharing of norms), governance structures that involve collective action (farmers groups) may have a comparative advantage. Likewise, if the capacity of the public administration in the country under consideration is comparatively high, governance structures relying on this sector may have a comparative advantage. Due to the recent interest in the role of good governance, there is an increasing number of indicators that attempt to assess the general effectiveness of the public administration across countries. The "government effectiveness" indicator by Kaufmann, et al. (2005) is an example. If there is already a large number of private enterprises or NGOs with the capacity to provide advisory services, models of contracting out are more likely to be successful than in situations in which this is not the case. NGOs are often effective on a small scale, but their

involvement on a larger scale may cause considerable challenges of coordination. In a dynamic perspective, it may be an important goal to increase the capacity of the different sector organizations involved. The possibilities to increase the effectiveness of particular branch of the public administration – in this case agriculture – independently from the general public administration may be challenging, since civil service rules and other provisions apply to the public administration in general (Section 4.2).

3) Aligning transactions with governance structures – considering costs and trade-offs

The next step in conducting the analysis proposed here is to derive hypotheses on the comparative advantage of different governance structures, based on insights from the theoretical and empirical literature. Following Williamson (1985), one can derive hypothetical cost curves for different governance structures, depending on their attributes. Figure 3 illustrates this approach.

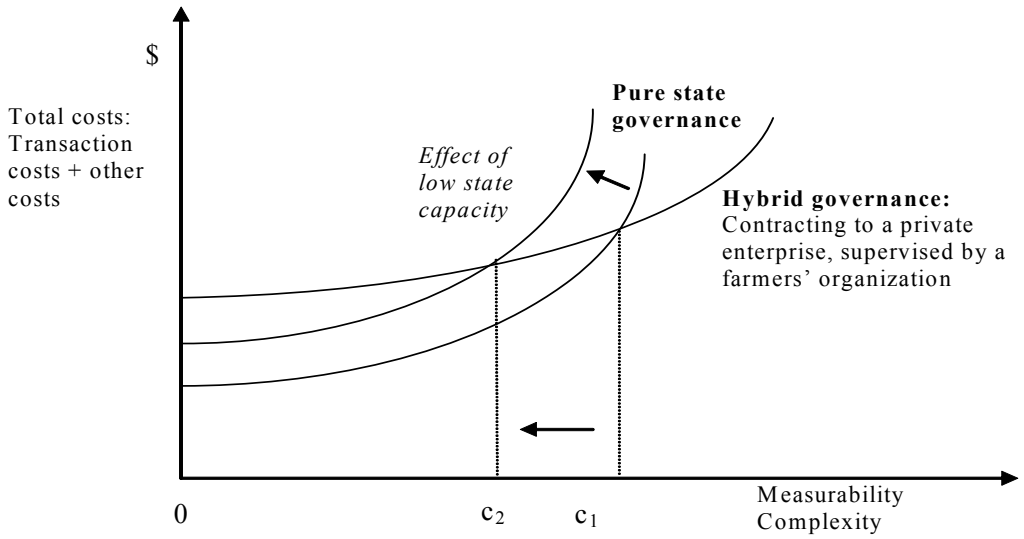


Figure 3. Comparative Efficiency of Different Governance Structures

The horizontal axis displays the relevant attributes, and the vertical axis measures the total costs arising for the provision of the service with a defined quality under

different governance structures. Figure 3 represents a situation, where the hypothesized cost of providing the service under pure state governance (public advisory services) increases rapidly with increasing relevance of the attribute, because of the monitoring and enforcement costs. It is hypothesized that a governance structure that involves the private and the third sector (hybrid governance) gains comparative advantage over state governance from point c_1 onwards. The establishment of the National Agricultural Advisory Services (NAADS) in Uganda is an example of such a model. If the value of c is lower than c_1, hybrid governance structures do not have a comparative advantage, because one has to take the fixed costs of setting up a collaborative arrangement into account. For example, public sector agencies, NGOs and private sector companies often have entrenched prejudges against each other. Strategies to build trust among these diverse actors, for example, by consultations and training, increase transaction costs of setting up partnership arrangements.

If the capacity of the state is low (upward shift of the cost curve for pure public governance), the hybrid arrangement gains comparative advantage from a lower value of the attribute onwards (shift from c_1 to c_2). If the local communities have a high capacity for collective action, which can be measured by their level of social capital, the cost curve for providing the service under a hybrid governance structures would be shifted downwards, thus increasing the comparative advantage of this governance structure.

Empirical Research Approaches

While the voluminous empirical literature on the impact of agricultural advisory services deals with services provided under different governance structures, most of these studies do not specifically address the question of "fit" between the choice of governance structure and the frame conditions. Recent studies that deal specifically with different reforms in governance structures, such as decentralization, contracting out or privatization, are mostly confined to qualitative case study methods (e.g., Rivera and Zijp, 2002; Rivera and Alex, 2005). In view of a lack of quantitative empirical evidence, the current debate on these reform strategies remains largely influenced by ideological

perceptions of what the role of the public and the private sector should be (compare Eicher, 2004).

The transaction cost approach presented in the preceding section, which focuses specifically on the "fit" of governance structures, has hardly been empirically applied in the literature on agricultural advisory services. The literature in other fields shows that transaction cost considerations can be applied empirically in two ways (see Shelanski and Klein, 1995, for a review). One approach is to use the transaction costs framework to formulate hypotheses on the type of governance structures to be expected for different types of transactions and frame conditions, and then use econometric techniques, such as multinomial logit models, to test whether the empirically observed choice of governance structures is consistent with the hypotheses. This approach is well suited to study profit-oriented organizations, where competition forces the enterprises to choose governance structures according to cost economizing criteria. However, if governance structures are determined by political rather than purely economic considerations, as is mostly the case in agricultural advisory services, it is necessary to directly measure the transaction costs involved in different governance structures in order to test hypotheses regarding the comparative advantages of different governance structures. While this is certainly an ambitious undertaking, there is an increasing number of studies showing that it is in fact possible to empirically measure transaction costs in the agricultural sector (Gabre-Madhin, 1999; Mann, 2000; Mburu and Birner, 2002; Pray et al., 2004).

Studying the transaction costs of pluralistic agricultural advisory services may yield important insights. For example, there are hardly any empirical studies of the costs involved in administering, monitoring and enforcing contracts with providers of advisory services. This lack of knowledge is rather surprising considering how widely contracting out advisory services is currently recommended. Studying transaction costs is also a way to assess the potential problems of corruption that may occur in using public procurement procedures for contracting advisory services. Analyzing the transaction costs incurred by the users of an advisory service will help to identify potential obstacles faced by the poor or by women to get access to advisory services.

Apart from quantitative applications that involve measuring transaction costs, the transaction costs considerations presented above can also be used to inform qualitative assessments of different reform strategies: They help to identify the different factors and frame conditions that are relevant in assessing the appropriateness of different reform options for agricultural advisory services. Informed by the above considerations, focus group discussions, participatory ranking techniques and multi-criteria analysis methods may be used to discuss and assess different reform options with stakeholders and policy-makers.

Analyzing Capacity, Organization and Management

This section deals with the capacity for the provision of advisory services, and the way in which the services are managed within the respective governance structures (Box M in Figure 2). Capacity, organization and management are interdependent both with the governance structures (Box G) and with the advisory methods used (Box A).[7] However, as argued above, it is useful to "disentangle" these characteristics in order to be able to design and analyzes advisory services that best fit a particular situation.

Capacity

Capacity in terms of staff numbers and staff qualification is a major characteristic of an advisory service. As indicated above, to the extent that the system is publicly funded, this capacity is determined by the fiscal possibilities and the political commitment of policy-makers and donors to invest in agricultural advisory services. Expenditure data and capacity levels of agricultural advisory services have been far less well recorded internationally than expenditure data on agricultural research. The last global consultation on agricultural advisory services was conducted by FAO in 1989, and has not been updated since then. In 1988, the average ratio of advisory service agents to farmers was 1:1,800 in Africa, 1:2,660 in Asia & Pacific, and 1:2,940 in Latin America.

[7] The term "organization" is used here to refer to the internal organization of an advisory service *within* a given governance structure. In the general literature on "Organization and Management," the term "organization" may refer to aspects that are classified as governance structures in the analytical framework presented here.

The percentage of female personnel in agricultural advisory services was 11 % in Africa, 15 % in Asia and the Pacific, and 15 % in Latin America (Swanson, Farner, and Bahal, 1990). Present estimations of the capacity of advisory services in developing countries differ widely. Anderson and Feder (forthcoming) estimate the total personnel of public sector advisory services in developing countries to be in the range of 400,000. Hu and Huang (2004) estimate the total number of advisory services personnel in China alone to be in the range of 700,000. Since international comparisons provide important benchmarking information for national-level policy planning, these discrepancies document the need for a renewed international effort to collect data on the capacity of agricultural advisory services.

In addition to staff numbers, the qualification and motivation of the advisory service staff is an important dimension of capacity. Issues to be decided include the appropriate pre-service and in-service training level of the field staff as well as the skills requirements in the administration of advisory services. The changing role of agricultural advisory services and the move from transfer of technology to participatory advisory methods (Section 4.3) require new skills, which go beyond the technical subject-matter qualification, in which the staff of advisory services is typically trained. The experience with the introduction of participatory advisory methods shows that it is a considerable challenge to build up the "soft skills" required to use participatory methods, to facilitate group activities and to help clients to develop problem-solving capacity (Hagmann et al., 1999). Likewise, the shift towards pluralistic advisory services requires new skills, which allow field and administrative staff to manage complex relations among a wide set of partners.

Another important area of capacity is the ability of an advisory service to design programs that support the agricultural and rural development strategy of the respective country. It would be useful to pay attention to the capacity to use tools such as the "recommendation domain" concept (Perrin et al., 1976) and to apply new technologies, such as Geographic Information Systems (GIS) for advisory services planning. A better understanding of how the *capacity for policy planning* regarding agricultural advisory

services can be improved would help countries to develop models that fit their country-specific conditions rather than to rely on generalized models promoted by donors. This is a particular challenge for African countries (Eicher, 2004).

Organization and Management

As compared to the debate on governance structures and advisory methods, the way in which an advisory service is managed has received comparatively little attention in the literature. A better understanding of the management of advisory services is, however, crucial in order to create effective and efficient services that address major challenges mentioned in the introduction: Challenges caused by the scale and complexity of advisory services, the associated problems of monitoring and evaluation, and the challenge of creating accountability. The T&V system entailed a prescription of the organization and management of the advisory service that aimed at addressing some of these problems (Anderson, Feder and Ganguly, 2006). However, the experience has shown that one particular model was not appropriate for the specific conditions of each country.

In the emerging pluralistic systems of agricultural advisory services, the complexity of the related organizational structures poses considerable new challenges for organization and management, for example, linking different types of actors to bring different types of services to different or the same clients; establishing incentive systems to attract complementary services; integrating these incentives in monitoring and evaluation and performance management. Research can help to meet these challenges by identifying the factors that make partnerships and coalitions between the different players in pluralistic advisory services work.

There is a variety of management tools that can be used to improve the performance of public service provision, such as Total Quality Management, Quality Circles, Results-based Management, Best Value, and Benchmarking. The application of such approaches in the field of agricultural advisory services has hardly been analyzed in a comparative perspective yet. The concept of “best practice” is one of those management

tools. As indicated in the introduction, this concept is rather problematic, especially if it leads to efforts of copying an entire system of agricultural advisory services and to "one-size-fits-all" approaches (as in the T&V case). The concept of "good practice," in contrast, is more useful, as it implies a practice that has proven useful, but can still be approved and adjusted. Applied to specific issues—such as reaching women farmers, or procurement procedures for contracting out advisory services—the concept of "good practice" can be a useful tool to improve the quality of agricultural advisory services.[8]

In analyzing organization and management, one has to take into account the idea that public sector advisory services are part of the general public administration. Hence, they need to be studied in this context because the possibilities to reform the advisory services administration independently from the public administration are limited (compare Binswanger, 2004). Many countries are undergoing general public sector management reforms (Levy and Kpundeh, 2004), but the implications and potentials of such reforms for agricultural advisory services have hardly been analyzed yet. The public sector management reforms of the last decade have largely been inspired by the concept of "New Public Management" (NPM), which is characterized by the application of private sector management approaches to the public sector. The NPM approach can be described as output and results-oriented, customer-driven and efficiency-focused (Jemiai, 2000). In terms of our analytical framework, NPM strategies imply changes in the governance structures (Box G), such as the creation of independent agencies and outsourcing, as well as changes in management procedures (Box M), such as the introduction of performance management systems, the creation of accountability, and changes in the advisory methods (Box A), such as the use of new information and communication technologies.

Empirical Research Methods

As can be derived from the above considerations, research issues to be addressed in the field of capacity, organization and management include the following:

[8] In agricultural production, the concept of "good agricultural practices" plays an important role for quality management. The EurepGAP standards are, for example, based on this concept.

- Incentive structure of advisory services personnel at different levels (depending on payment structure and promotion rules);
- Strategies to promote leadership in the organization;
- Use of management instruments that create responsiveness and client-orientation (e.g., making participatory monitoring and evaluation a management instrument; introduction of results-based management approaches; management approaches to mainstream gender concerns);
- Strategies to manage linkages with agricultural research and education organizations and with a range of new partners in the agricultural innovation systems (such as providers of complementary services, agri-business enterprises, etc.); and
- Possibilities to promote cross-country learning and benchmarking (e.g., in the context of the emerging Sub-Saharan Africa Network of Agricultural Advisory Services SSANAAS).

Research in this field can draw on theoretical concepts and methods used in organizational sociology, administrative sciences and public sector management research. Empirical research approaches include both qualitative case studies as well as quantitative analyses that based on surveys among the personnel of agricultural advisory services. Action research—in collaboration with advisory services agencies undergoing reform processes—is a particularly important methodology in this field. The analysis of the organization and management of an agricultural advisory service is closely related to the analysis of its performance, which is further discussed in Section 4.4.

Analyzing Agricultural Advisory Methods

This subsection deals with the factors that influence the appropriateness of different methods and approaches of providing agricultural advisory services, depending on the frame conditions (links between Box A and Boxes E, S, F and C in Figure 2). Just as there are many governance structures for advisory services, which are subject to

debate, there are many different methods for actually providing these services. These methods are equally contested, as the current debate about farmer field schools shows.

Classifying Advisory Methods

The methods used in the provision of agricultural advisory services focus on advising, facilitating, and transferring information and technology to the users of these services. Some techniques emphasize adult education methods, others transfer of technology. As mentioned in Section 2, agricultural advisory services—and the methods used to provide them—have evolved considerably over the past few decades. According to van den Ban (1998), it is useful to distinguish different types of decisions that advisory services may seek to support, including decisions on the adoption and management of more productive technologies; the choice of crops and livestock to be produced; the relations between farm and household/family (e.g., how much to consume and how much to invest); and relations with actors in the environment of farm households, such as input and output suppliers, the government, cooperatives, etc.[9]

The shift from transfer of technology to a wider range of agricultural advisory services has led to the development of a variety of advisory methods. These methods can be classified according to different criteria:

- Types of training or technology transfer (demonstrations, field days, week-long courses, farmer–to–farmer exchanges);
- Number of clientele (individual, group-based, mass approaches);
- Involvement of clients in planning and problem-solving ("top-down" methods; participatory methods);
- Specificity of content (limited to specific crops/livestock or dependent on needs identified by clients in different fields);

[9] Hoffmann (1992, quoted in van den Ban, 1998: 59) argues that an advisory service should concentrate its limited resources on those decisions which are most important for the welfare of the farm household.

- Types of media used (information and communication technology or ICT, radio, drama, newspaper); and
- Adult education orientation (social learning, humanist, cognitive).

Advisory techniques can also be classified according to models or approaches, which include a specified set of methods and are described by a certain "label" or acronym, such as Farmers' Field Schools (FFS), Participatory Technology Development (PTD) or Participatory Extension Approach (PEA). Such models play an important role in agricultural advisory services in developing countries, because development agencies and NGOs often promote certain models. Annex 2 describes some important models.

Identifying Factors that Influence the "Fit" of Advisory Methods

Different factors influence the appropriateness of the advisory methods to be used, such as the nature of technology itself (e.g. simple, complex), the stage of adoption, the literacy level of the farmers, the type of farming system, socio-economic factors, and the social capital (capacity to cooperate) of the farmers involved. As in the case of analyzing governance structures, it is important to identify the goals against which the appropriateness of advisory methods is to be evaluated. For example, if empowerment and reaching disadvantaged groups and women is a goal, the choice of advisory techniques has to be adjusted accordingly.

An important factor in selecting advisory methods is the level of funding that governments and donors are willing to invest in advisory services, taking possibilities of cost-recovery by charging fees into account. In many developing countries, the ratio of farmers to advisory service agents is in the range between 2,500 and 1,000:1 (see above). This obviously limits the possibilities to use staff-intensive advisory methods such as individual approaches and methods that involve frequent visits, in spite of the advantages that such methods may have.

Based on these considerations, different criteria have been suggested for assessing the appropriateness of advisory methods (Anandajayasekeram et al., 2001; Campbell and

Barker, 1997). These include relevance, adequacy, technical feasibility, economic feasibility, effectiveness, efficiency, and impact. Further criteria include gender and other equity goals, ability to suit local socio-economic conditions, social acceptability, environmental sustainability, and potential for institutionalization. Van den Ban and Hawkins (1985) provide a useful set of criteria to judge if the advisory method is well-chosen:

1. Is the chosen method *adapted* to whether the method is seeking a change in knowledge, skills, attitude, or behavior?
2. Are the educational *activities clearly specified* so that we know what the farmer or other user will see, hear, discuss, and carry out?
3. Are the different methods *integrated* in such a way that they reinforce each other?
4. Does the planned *time scale* make it possible to carry out all of these activities well?
5. When choosing learning activities, has the advisory services agent adequately considered the *needs, skills, and means* of the target group?

Further insights into analysis of advisory methods can be derived from adult education and communication theory to assess the suitability of different approaches for different conditions and obtain criteria to assess different approaches.

Understanding the principles of adult education is important in assessing the suitability of different methods, because it helps to understand what is motivating the people to participate, and what underlying orientation to adult education is present in the approach being used. Andragogy, the art and science of helping adults learn, is quite different from traditional pedagogical learning for children and youth. As research in andragogy shows, adult learners want to know the purpose of what they are learning, have more internal motivation than young learners, and are better able to self-direct their learning. They also have a wealth of experience, which needs to be considered in the design of advisory methods.

There are five orientations to adult learning—humanist, behaviorist, social learning, cognitive and critical reflection. The humanistic orientation places great emphasis on respect for individual differences, so each person will be highly valued and encouraged to contribute and have her/his needs met. In the behaviorist orientation, the teacher attempts to bring about behavioral change through stimulus and response. With the social learning orientation, learning is focused in social settings, with the belief that people learn effectively from others like themselves. The cognitive orientation uses thinking and logical reasoning to educate adults. The learning process happens inside the learner. Finally, the critical reflection method of learning teaches the student to use her or his own faculties to solve problems. Traditionally, the behaviorist approach was the basis of most advisory service approaches. However, farmer field schools and other group–based and participatory advisory methods now use the social learning and the critical reflection approaches. The inclusion of adult education approaches can be seen as a major distinction to conventional methods used by agricultural advisory services.

Communication theory can also help to identify appropriate methods, depending on the goals and priorities, the contents, and the characteristics of the clients. Communication can be defined as a process whereby participants "create and share knowledge with one another in order to reach a mutual understanding" (Rogers, 1995: 5). Communication is, of course, crucial to diffusion of information. One important concept in communication is the channel of communication, or means by which the message passes from one individual to another. For instance, mass media channels can reach a large number of people at once, while interpersonal channels involve face-to-face exchange between people. Different channels have advantages and disadvantages: mass media can reach a large number of people, but there is not the element of trust that can be found in the interpersonal channels and may be important to promote behavioral change. Related to this is the issue of homophily, the degree to which people have similar attributes, beliefs, education, etc. (Rogers, 1995). Communication is more effective among individuals who are homophilous. A number of other factors have also been found to contribute to the success of communication in agricultural advisory services. They

include policies and markets that are conducive for communication, the involvement of farmers through participatory methods, the involvement of farmers' organizations as partners, the utilization of different media options as well as monitoring and impact evaluation of communication strategies.[10] In analyzing the role of communication, it is also useful to distinguish different models of communicative intervention, such as the interactive model and the instrumental model (Leeuwis and van den Ban, 2004).

Empirical Research Methods

The fact that advisory services have changed in recent times from providing education and new technologies to more of a facilitation role involves considerable challenges for the empirical analysis of advisory methods. As Christopolos and Kidd (2000) argue, it is difficult to show the impacts of facilitation. Pluralistic advisory services involve additional challenges for empirical analysis. If there are multiple providers and mixed models, none of the service providers may take responsibility for analyzing the methods being used. In spite of the challenges of data collection, ultimately, it should be the farmers and other users of advisory services who judge the quality of the services received (Christopolos and Kidd, 2000).

Unfortunately, there is a dearth of advisory methods evaluation in the literature, most analysis consisting of self-evaluation and confined only to project reports. The World Bank, a long-time supporter of advisory services in developing countries, has carried out much of the evaluation of methods, especially the Training and Visit (T&V) method. More recent evaluation is being done of the farmer field school (FFS) approach. Other types of participatory or farmer-led advisory services are often promoted by non-governmental organizations or community-based organizations, which often do not have the goal of publishing any of the evaluations that may be conducted. Table shows some of the studies evaluating advisory services that have been published. In interpreting the results, one has to consider that these studies do not usually isolate the impact of the

[10] These factors were identified by FAO and GTZ (publication forthcoming).

advisory method used (Box A) from the impact of governance structures, management and capacity (Boxes M and G).

Table 2. Studies Evaluating Advisory Methods

Study	Type of Advisory Service	Methods	Major Findings	Shortcomings
Bindlish and Evenson, 1997	Training and Visit (T&V)	Econometric review; before and after comparison	High returns to advisory services through T&V	Limited data Arbitrary specifications
Gautam, 2000	T&V	Empirical assessment through qualitative and quantitative methods	Limited impact of T&V	Use of dummy variables for high/low districts wipes out district effects
Feder et al., 2003	Farmer field school (FFS)	Econometric difference-in-differences; longitudinal and latitudinal; survey	No significant impact of FFS on pesticide expenditure and yield	Small sample size Large unexplained variance in analysis
Erbaugh et al., 2001	IPM CRSP[2] Project	*Ex post* comparison of groups	More active participation increases IPM knowledge	Project beneficiaries few and economically advantaged
Mangan and Mangan, 1997[1]	FFS	Longitudinal comparison of 2 treatments; survey	FFS farmers continue learning and have lower insecticide use	Small sample size Pseudo replication
Praneetvatakul and Waibel, 2003	FFS	Longitudinal and latitudinal; double delta approach, survey	Significantly pesticide reduction and knowledge increase by FFS	
Rola et al., 2002	FFS	Survey method comparing old and new schools; FFS farmers, exposed and non-exposed farmers	FFS significantly higher knowledge scores; knowledge was retained; no evidence of diffusion	
SEARCA, 1999[1]	FFS	Latitudinal comparison between FFS and non FFS; structured questionnaires, semi-structured interviews	FFS farmers used less insecticide, had higher yields, and higher knowledge scores than non FFS farmers	FFS and non FFS farmers not shown to be comparable groups Time between training and survey not considered

[1]*From van den Berg, 2004. IPM farmer field schools: A synthesis of 25 impact evaluations. Wageningen University.*
[2]*Integrated Pest Management Collaborative Research Support Program*

After reviewing 25 impact evaluations of Farmer Field Schools, van den Berg (2004) recommended the combination of diverse methods when evaluating the schools. Similarly, the framework developed in this paper uses a combination of analytical techniques from various disciplines. With this in mind, future research will benefit from using a variety of techniques from different disciplines in analyzing advisory services. Including social network analysis in impact assessment studies is an example. Using this method in a study of FFSs in Senegal, Witt et al. (2006) found that a critical mass of trained farmers is important to attain effective dissemination of information. It is also useful to combine both qualitative and quantitative methods, and various designs as appropriate. Specifically, it will be useful to use experimental, quasi-experimental, and *ex post facto* designs, which help to establish causality and show relationships among variables. These methods are further discussed in Section 4.5 on impact assessment below (see also Annex 3).

Because it is crucial to have the views of the participants in evaluation, future research should also include participatory evaluation methodology. Another point that van den Berg (2004) made was that there was no agreed conceptual framework for measuring impact of the field schools. The authors hope that this paper will help to address this issue by providing such a framework. One more critique of the 25 impact evaluations by van den Berg (2004) was that the studies were either rigorous or comprehensive, but never both. Future research will need to address this shortcoming through bringing rigor to more comprehensive studies.

Analyzing the Performance of Agricultural Advisory Services

This section deals with approaches to measure and explain the performance and quality of agricultural advisory services (Box P in Figure 2).

Measuring Performance

Measuring the performance of an advisory service is methodologically less demanding than assessing its impact at the household level or the economy-wide level,

because it avoids important attribution problems inherent in impact assessment (see below). From a policy perspective, it is the impact of an advisory service in terms of its contribution to societal goals (Box I in Figure 2) that is ultimately important. However, research on performance is useful because assessing the performance and quality of an advisory service is an important instrument for the management of this service (Section 4.3). Research can contribute to improving this instrument. Moreover, linking research on performance with impact assessment can help to identify those aspects of performance that are most important for achieving impact. *Vice versa*, results from impact assessment are required to assess the efficiency of an advisory service, which is an important performance criterion.

Research on performance can be based on monitoring and evaluation systems that are used by advisory services, even though independent data collection is also important to overcome the potential bias. Most public sector advisory services have some type of monitoring and evaluation in place. Activity monitoring is in fact a standard instrument in the public administrations. For advisory services, activity monitoring usually refers to number of clients visited, number of demonstration plots established, etc. Donor-funded projects involve monitoring and evaluation systems that are often carried out in addition to reporting systems of the public administration. There is, however, a commitment by donors to harmonize their monitoring and evaluation systems among each other and align them with country-owned systems (compare the Paris Declaration on Aid Effectiveness, February 2005).[11] Monitoring and evaluation systems that include satisfaction surveys among clients are more data intensive and less common in public administration, even though they have been introduced in some countries as part of public sector management reforms. NGOs can also play an important role in measuring and publicizing the performance of public services, as the Citizen Report Card method developed by the Public Affairs Center (see http://www.pacindia.org/) in Bangalore shows.

Data on performance collected by researchers, NGOs or the service providers themselves are relevant for supporting learning processes within an organization. This

[11] See http://www1.worldbank.org/harmonization/Paris/FINALPARISDECLARATION.pdf.

insight has led to the development of process monitoring approaches, in addition to conventional progress monitoring. Table A3 in Annex 1 describes the major characteristics of both systems. Research on performance systems for advisory services should contain elements of both progress and process monitoring, and of evaluation. Table A4 in Annex 1 summarizes the complementary roles of monitoring and evaluation. Action research that involves clients and stakeholders in defining the performance criteria to be monitored and evaluated can be an important research strategy in this context. Likewise, methods of impact chain analysis or outcome mapping will also be useful in this context. Research on the performance of advisory services can make important contributions to the quality management of services delivered by different service providers and to the management of contracts with service providers.

Reaching consensus on appropriate criteria is an important task in order to assess how well a system performs, particularly if new objectives such as empowerment or demand-orientation are introduced. For example, it is a common assumption that contracting-out advisory services will make a system more demand-driven, especially if farmers' organizations are involved in the contracting process. However, if the advisory staff to farmer ratio is in the range of 1: 1,000 or more, there is obviously a need to "aggregate" the demand of the farmers. Hence, measuring to which extent an advisory services system is demand-driven requires measuring how well this organization and aggregation process works.

Assessing Performance in an Agricultural Innovation System Context

Applying an agricultural innovation system (AIS) perspective, the analysis of the performance of advisory service can be part of a wider analysis of the performance of the agricultural innovation system. In pluralistic advisory services, the relations between different actors become more complex, which requires new analytical approaches to the study of how public sector actors interact with actors from private firms and civil society organizations. It is also important to find out which type of relationships generate better outcomes for small-scale farmers and other agrarian agents.

Key questions include: How do different modalities of advisory services combine with different research modalities and education modalities to generate, disseminate, and utilize knowledge? Are new research and education modalities sufficiently integrated or linked to modalities in advisory services to ensure the success of an innovation process? And if so, who are the key actors within these linkages, and how do their relationships function and evolve within a given socioeconomic context? Are the outcomes of their innovative activities actually addressing the technological, institutional, and organizational needs of small farmers, agrarian laborers, and other marginalized social groups? Methodologies with which to answer these questions include social network analysis; transactions cost analysis; game theoretic modeling; and other methods where appropriate (Spielman, 2005).

A further methodological approach which has been developed in the innovation systems context are innovation indicators, which can be used to assess the innovative performance of a sector or country as compared to other countries, and to track changes over time. This approach has been widely used to benchmark the performance of innovation systems in OECD countries. An example is the European Innovation Scoreboard System (http://trendchart.cordis.lu/scoreboards/scoreboard2004/index.cfm).

Based on this approach, one can develop a variety of agricultural innovation indicators, including indicators describing capacities and levels of investment in agricultural research, advisory services and training and education; indicators of linkages and partnerships with other actors in agricultural innovation systems; indicators of trans-boundary technology exchange; indicators of targeting the innovation potential of poor and disadvantaged groups, and of women; and outcome indicators such as number of new varieties registered, and adoption rates of innovative agricultural practices. Such agricultural innovation indicators, which are suitable for benchmarking across countries, can play an important role in guiding agricultural innovation policies.

Explaining Performance

According to the analytical framework presented here, performance indicators are influenced by governance structures (variables in Box G), capacity, organization and management (Box M), the advisory methods (Box A), and the fit of these characteristics with the frame conditions (Boxes E, S, F and C). In principle, regression techniques can be used to explain variation in performance indicators among different service units (e.g., geographical areas served by advisory services stations) dependent on these factors. Lynn et al. (2001) developed a similar approach to analyze the performance of the public administration in other fields than advisory services. In pluralistic systems, explaining the differences in performance among different service providers is an important field of research. However, one needs to take into consideration that some of the variables, especially the governance structures (e.g., level of decentralization), may not vary within the country, therefore their influence on performance can only be evaluated statistically in cross-country studies.

Analyzing the Impact of Agricultural Advisory Services

As indicated earlier, the impact of agricultural advisory services in terms of its contribution to societal goals (Box I in Figure 2) is of particular interest from a policy perspective. Impact assessment involves far-reaching methodological challenges, because the impact of advisory services depends on the behavior of the agricultural producers (Box H), which is influenced by many factors, thus leading to attribution problems and other methodological challenges. In this section, we discuss the challenges of impact assessment and the research strategies that can be applied to address them.

Challenges of Impact Assessment

Multiple goals

In much of the economic impact evaluation literature, impacts are considered to be changes in productivity or income resulting from the program being evaluated, and impact assessment implies ex-post assessment (Horton and Mackay, 2003). Impacts of advisory services have been measured by agricultural economists using the common

economic principles of project appraisal, e.g. internal rate of return, economic surplus, marginal rate of returns (Anderson and Feder, 2005). Parametric, non-parametric and qualitative methods are used to measure all or some of these impact criteria. To estimate the marginal effects of investment in advisory services, econometric methods are commonly used to estimate the production or cost functions. Econometric methods are also used in the total factor productivity function analysis that could be used in lieu of production and cost functions. The common variables included in the econometric analysis are the standard factors that affect crop productivity, factor productivity and cost of production. These include the factors of production such as labor and land, socio-economic characteristics of producers and their families; village level factors such as market access, population density, soil quality, agricultural potential, etc. (e.g. see Nkonya, et al., 2005).[12]

The purposes of such assessments are mainly to assure accountability to investors for the use of their funds and to assist in communicating the results achieved. However, as in case of performance measurement (see above), other objectives of are increasingly considered important, particularly promotion of organizational learning (Horton and Mackay, 2003; EIARD, 2003). Related to this point, the types of impacts that need to be assessed may be much broader than simply impacts on agricultural productivity or even farmers' incomes, and may vary from one impact assessment to another. Increasingly, evaluations are asked to assess impacts of programs on a wide range of outcome indicators, including equity, poverty, household capacity to innovate, farmer empowerment, addressing gender-specific needs, sustainability of natural resource use, environmental impacts, food safety, nutrition and others. Impacts on intermediate indicators such as farmers' awareness, adoption or adaptation of particular technologies, and commercial marketing behavior may also be assessed. Operationalizing and measuring such complex and multi-dimensional concepts as poverty, empowerment, sustainability, commercialization, etc. poses a major challenge (Pender, 2004).

[12] Other parametric methods used include the economic surplus method that simply computes the consumer and producer surplus due to an advisory services investment using simple descriptive statistics (e.g. see Nkonya and Parcell, 1999; Hayami and Herdt, 1977).

Applying an innovation systems perspective, it is also useful to study the contribution of advisory services to the creation of networks as a measure of impact (Ekboir, 2003). This approach is based on the proposition that the impact of advisory services depends on the interaction of actors in networks, and cannot be attributed to individual actors. Relevant parameters to study the effectiveness of networks are the rules for generating, collecting and sharing information, financing procedures, intellectual property-rights regulations and availability of human and financial resources. For individual agents the relevant indicators are their patterns of participation in particular networks, benefits and costs of participation, evaluation criteria, financial arrangements and institutional cultures.

This approach is related to the suggestion to assess the impact of advisory services on social capital, which can be defined as the ability to facilitate collective action for mutual benefit through the organization and participation of farmers and rural people (Swanson, 2004: 11). Social capital is viewed as being economically useful since individuals acting collectively can improve their economic conditions.

Attribution problems and other methodological challenges

Even when the objectives of the assessment are clear and measures of impact are available and adequate, attributing changes in indicators to the program being assessed is generally very difficult. In the economic program evaluation literature, particular concern has focused on biases resulting from non-random selection or assignment of program participants to particular "treatments". To illustrate, suppose that the evaluator is interested in determining the impact of an advisory services program on crop yield:

Let Y_{ei} = crop yield with advisory services program by farmer i

Y_{wi} = crop yield without advisory services program by farmer i

Holding all else constant, the impact of advisory services on crop yield for farmers participating in the advisory services program (average treatment effect on the treated (ATET)) is given by:

$$ATET_i = E(Y_{ei} - Y_{wi} | X_i, P_i = 1)$$

$E(Y_{wi} | X_i, P_i = 1)$ is the crop yield that participating farmer i (P=1) would have obtained had she not participated in the program, conditional upon observable characteristics and inputs by farmer i (X_i). The basic problem of attribution is that the counterfactual ($Y_{wi}|X_i, P_i = 1$) is not observable since farmer i is assumed to be participating in the program.

If an experimental approach can be used, in which households can be randomly assigned to receive or not advisory services, an unbiased estimate of $E(Y_{wi}|X_i, P_i=1)$ is possible, since random assignment assures that the distribution of unobserved and observed characteristics of households in the program are the same as those not in the program. Assessment of average program impacts can be done without identifying assumptions or complicated econometric approaches in this case. This is why social experiments are often viewed as the gold standard in evaluation work, and advocated by many analysts (e.g., Cook, 2001; Duflo and Kremer 2005; Heckman, et al., forthcoming). However, social experiments are confronted with a number of practical as well as methodological problems, which are further discussed in Annex 3. Perhaps because of these problems, no randomized social experiments to evaluate impacts of advisory services programs have been implemented so far, according to one recent review (Anderson and Feder, 2005).

Other problems that can undermine the ability to measure impacts, whether an experimental or non-experimental approach is used, include spillover effects, lagged impacts, data problems, and sample attrition (Heckman, et al., forthcoming; Anderson and Feder, 2005). Spillover effects refer to impacts of the program on non-participants. For example, information provided by advisory services programs may be shared with program non-participants, causing changes in yields or other outcomes for non-participants as well as participants. In this case, comparisons of program participants and non-participants will underestimate the impacts of the program. Other reasons for spillover effects include impacts of programs on prices or availability of inputs and outputs, environmental externalities, and responses of managers of other programs to the presence of a particular program. In general, neglecting such effects may either

overestimate or underestimate total program impacts. Accounting for such impacts requires a model of the spillover impacts (e.g., a model of information diffusion or a market equilibrium model) and other sources of evidence (e.g., knowledge of demand and supply elasticities).

Lagged effects refer to the fact that the impacts of advisory services interventions may not occur immediately; e.g., it may take years for advisory services to eliminate gaps between economically achievable and farmers' actual yields (Alston, et al. 1995; Anderson and Feder, 2005). Assessing the nature and impacts of such lags requires longitudinal data and intertemporal methods of analysis (i.e., use of net present value or internal rates of return). Methodological issues such as the appropriate lag structure and discount rate must be addressed in such analyses (Ibid.).

Data problems include difficulties in operationalizing and measuring appropriate indicators of inputs, outputs and outcomes; issues of data comparability (especially when different survey instruments are used at different points in time or for different sub-samples); problems of missing values and others (Heckman, et al., forthcoming). Such mundane problems often lead to larger biases than problems such as selection bias that are often emphasized in the impact evaluation literature (Ibid.).

Sample attrition refers to respondents being lost from the evaluation sample for whatever reason (e.g., lack of interest in participating, migration, etc.).[13] Attrition can cause sample selection bias in the remaining sample (if the likelihood of attrition is correlated with factors affecting the impacts of the program), and non-experimental approaches are required to deal with the resulting bias, even in evaluating social experiments (Ibid.).

Different non-experimental approaches have been developed to address selection and other biases in impact evaluations.[14] Selection bias can result from non-random

[13] Sample attrition is not the same as program dropout, since it can affect non-participants as well as participants, and may not occur among program dropouts (since data may still be collected from such respondents) (Heckman, et al., forthcoming).
[14] This discussion draws heavily from Ravallion (2005).

program placement—e.g., programs may choose to operate in locations or with communities that are more or less able to benefit from the program than the underlying population for which program impacts are sought—or from non-random choice of participation—e.g., households that are more able to benefit from a program may self-select into the program.

The methods commonly used to address these biases include econometric parametric and non-parametric cross section regression approaches, double difference (DD) estimation, and propensity score matching (PSM). These approaches differ in the assumptions that they make to identify program impacts; they thus have different strengths and weaknesses. Annex 3 describes and discusses these approaches in more detail. Some of these methods were used in the evaluation of advisory methods summarized in Table 2.

Some authors argue that attributing impacts to particular agricultural research and dissemination efforts is impossible or too costly (Ekboir, 2003, 2005; EIARD, 2003), because such efforts are part of a complex adaptive system, beneficiaries of technology development and dissemination programs often modify the technologies that are promoted, impacts depend on many external factors that cannot be controlled and that result from a network of agents rather than any single program and hence cannot be separated from impacts of the activities of the entire network. Other problems include differences in the objectives of the beneficiaries and the objectives assumed by those designing advisory services programs. Impacts that were not anticipated are also difficult to measure and assess, especially if they have long time lags, such as schooling of children that becomes possible due to the adoption of labor-saving technologies. Further challenges to impact assessment are caused by the increasing complexity of innovations because of market integration and accelerated technical change in marketing and information technologies. Individual agents do not command all the assets they need to innovate as often as required by market and technical developments. (Rycroft and Kash, 1999). To get access to these assets, agents form networks that, in the case of agriculture, can include farmers, processors, retailers, researchers, advisory service agents and input

suppliers. Since impacts result from the actions of the whole network, it is difficult to attribute them to individual agents.

External validity: Can findings of evaluations be scaled up?

The economic literature on program impact evaluation has concerned itself mainly with the issue of "internal validity"; i.e., whether the evaluation design allows a valid inference about the impacts of the program in the particular context in which it was evaluated. At least of equal importance to policy makers is the "external validity" of the evaluation; i.e., whether and how the findings can be generalized to other contexts (Heckman, et al., forthcoming). This issue relates to some of the issues mentioned above, such as the lack of theory and empirical information in most evaluations about the process that generated the outcomes, how it is influenced by contextual factors, and about spillovers and general equilibrium effects as programs are scaled up (e.g., expansion of an effective advisory services program to national scale may face scaling problems due to constraints on available skilled capacity, rising costs and falling commodity prices resulting from increased production, etc.). There is a clear need for research on the impacts of advisory services to address these issues, as well as the more commonly emphasized concerns about internal validity.

Implications for Research on the Impact of Agricultural Advisory Services

A common thread in much of the recent literature on program evaluation is the conclusion that there is no single best method to use in all circumstances (e.g., Horton and Mackay, 2003; Ravallion, 2005; Heckman, et al., forthcoming). Even within the relatively narrowly defined objectives of the economic program evaluation literature, with its emphasis on ex-post attribution of impacts on a few key variables, there are many different methods that depend upon different identifying assumptions and have different strengths and weaknesses. If broader objectives and the costs and relative merits and drawbacks of different evaluation methods are considered, as advocated by Horton and Mackay (2003) and many others, an even broader set of methods should be considered.

Our view is that a combination of qualitative and quantitative methods is needed, with triangulation of results from different approaches, to achieve robust conclusions that are of greater use to policy makers and program managers, as well as being scientifically rigorous and defensible.

Qualitative and participatory methods

Qualitative and participatory approaches that have been advocated to address the concerns include the use of impact pathway analysis (Section 4.4), program theory, formative evaluation, participatory evaluation, empowerment evaluation and developmental evaluation (Douthwaite, et al. 2003; Springer-Heinze, et al. 2003; Mackay and Horton, 2003). To the extent that these methods focus on the quality of advisory services rather than ultimate outcomes, they are considered as performance measurement methods in terms of the framework proposed here (Section 4.4). Some authors consider these methods and economic impact assessment methods as mutually exclusive since they are associated with different paradigms: the constructivist perspective emphasizing subjective reality and experimental learning, versus the positivist approach emphasizing objective reality and hypothesis testing (Mackay and Horton, 2003).

Contrary to this view, it is argued in this paper that qualitative/participatory methods and quantitative impact assessment methods are complementary and can usefully inform each other. Hence, both research strategies should be pursued, further developed and combined. For example, participatory methods can be used to define criteria to be used in quantitative impact assessment. Conversely, information from economic impact assessment can inform institutional learning processes. Methods that deal with intermediate outcomes are useful to inform economic assessment methods focusing on ultimate outcomes. As is emphasized in the recent economic program evaluation literature, in depth knowledge of the nature of the program, its context and the process by which it achieves impacts is essential for both internal and external validity. Thus, more information on the activities and intermediate outputs and impacts of programs will be helpful in this process, as argued by Ravallion (2005).

Quantitative impact assessment methods

Concerning approaches to achieve internal validity, we believe that experimental approaches should be considered and used where feasible, but should not be seen as the only option. A mixed approach could be pursued, in which some parameters are randomly assigned (e.g., placement of an advisory services program in particular communities during a pilot phase, use of particular advisory services approaches such as Training and Visit (T&V) vs. farmer field schools), while leaving substantial space for local communities to participate in defining what specific activities will be pursued and technologies will be promoted by the program, who participates, etc. Random assignment of at least some parameters will help to identify some impacts, but other means of identifying suitable instrumental variables should also be pursued. Where possible, a baseline survey should be conducted before the program intervenes, as well as conducting surveys and using qualitative monitoring and evaluation during and after the program, to enable use of DD and PSM methods (possibly combined). If suitable data are collected from the start of the program, different evaluation methods can be used and more robust conclusions drawn. Even where baseline data cannot be collected, there are still alternatives combining different methods that can increase the reliability of the results (such as combining PSM and IV estimation) (Ravallion, 2005).

Concerning approaches to achieve external validity, we believe that more theoretical and modeling work is needed, as well as empirical work conducted using a common conceptual framework and approach in different contexts, to allow drawing comparative conclusions about the influence of contextual factors on program impacts. Research on suitable "recommendation domains" (Perrin et al., 1976) can help to guide selection of study sites and draw lessons about other areas where similar impacts can be expected. A sufficiently large sample of empirical studies within such domains will be needed to draw robust conclusions about domain specific impacts. Computable General Equilibrium (CGE) or multi-market models can be used to assess market impacts of programs as they are scaled up, and provide feedback to micro studies of estimated rates of return, taking such price responses into account (more on this in the next section). In

depth case study research on diffusion of impacts of advisory services programs is needed, considering how advisory services operate within the broader agricultural innovation system. Such studies may be able to define "diffusion zones" for particular types of information and technologies, which can help to define appropriate sampling approaches to use in assessing the impacts of advisory services (e.g., to identify communities sufficiently "distant" to serve as a suitable counterfactual), as well as identifying and quantifying to the extent possible the impacts of diffusion within such zones. Impacts of advisory services programs on natural resource management and environmental spillovers also should be studied in depth, where such impacts are likely to be significant. Combining such research with the current emphasis on assessing impacts of agricultural research and development programs on broader measures of poverty as well as productivity can enable identification of synergies or tradeoffs among these different objectives arising from advisory services approaches, and domain specific recommendations of approaches that can exploit "win-win-win" opportunities where they exist or to rationalize tradeoffs where they must be faced.

Beyond assessing impacts and tradeoffs/synergies of advisory services programs and approaches in particular domains, it will be valuable to estimate the private and social costs and benefits of advisory services programs, building upon the impact assessment. Such estimates are needed to help guide public investments in advisory services. We address this issue in the following section.

Estimating the Costs and Benefits of Advisory Services

Indicators of Economic Performance

Estimating the costs and benefits of agricultural advisory services, and calculating related indicators such as cost-benefit ratios, rates of returns to investment and efficiency measures is of particular importance for guiding investment in advisory services. Since cost-benefit analyses rely on data from economic impact assessment, they are usually considered to be a part of economic impact assessment. In terms of our framework, they are considered as measures of the economic performance (Box P) of an advisory service,

which rely, however, on data from impact assessment (Box I). In case of multiple service providers in pluralistic systems, comparing cost-benefit ratios or other economic performance indicators can provide important insights for advisory services reform. So far, standard techniques of project appraisal have been widely used in the economic evaluation of advisory services in order to assess the profitability of investment. In general, such studies have shown relatively high returns to investment in advisory services. For example, in a meta-analysis of 292 research studies, Alston et al. (2000) found median rates of return of 58 percent for advisory services investments, 49 percent for research, and 36 percent for combined investments in research and advisory services.

In line with the considerations presented in Section 4.4, economic performance indicators could be applied as a management instrument. In pluralistic and decentralized systems, it will be useful to calculate indicators that have received less attention, so far. For example, to compare the efficiency of decentralized advisory service units or of different service providers, one could use techniques that have been applied to assess the efficiency of local governments, such as stochastic frontier function approaches (see Dollery and Wallis, 2001, for a review). Such efficiency measures could then be used for benchmarking.

As mentioned above, benefits of advisory services can be derived from economic impact assessment studies and are hence subject to the methodological problems discussed above. The costs of advisory services are relatively easy to assess as long as the advisory services are publicly financed, and transaction costs are not taken into account. As proposed in Section 4.1, it is useful and possible to expand current approaches by taking transaction costs into account. The empirical measurement of transaction costs is an important field of research, which will contribute to the comparative analysis of different modes of service provision in pluralistic systems.

Costs and benefits of reforming agricultural advisory services

Reforms of advisory services, especially changes in the governance structures of these services – involve particular costs, such as the costs involved in dismissing public

service personnel. Hence, it is useful to assess the costs of reforming advisory services as well as the benefits, which are derived from the improvements in economic performance achieved by the reform. Such studies are comparatively scarce. An exception is the study by Fleischer, Waibel and Walter-Echols (2002) which assesses the costs of transforming a public sector system of agricultural advisory services.

Willingness to Pay (WTP) for advisory services

As discussed in Section 4.1, cost recovery is an important reform strategy in agricultural advisory services. A number of different countries have contracted out advisory services to private providers or have diversified the funding of this activity (Carney, 1998; Berdegué and Marchant, 2002; Katz, 2002; Rivera and Zijp, 2002; Chapman and Tripp, 2003; Davidson and Ahmad, 2003; McFeeters, 2004). Research can support this type of reform strategy of advisory services by evaluating how much a farmer would be willing to pay for advisory services by applying the Willingness-to-Pay (WTP) method. As such WTP studies could be used to estimate the direct value or benefit of agricultural advisory services in the absence of a market for such services.[15] This could also be considered as an alternative strategy to economic impact assessment for estimating the benefits of advisory services.

Studies have often derived WTP for advisory services from activities associated with dissemination of information and direct contact with farmers. Those activities are precisely the ones that have been commercialized, or transferred to the private sector (Le Gouis, 1991). WTP for advisory services can be directly or indirectly determined. An example of indirect estimation is the work of Dinar (1996) that estimated demand and supply for advisory service visits and then derived WTP for these services from the per hectare value added by subtracting the production cost (including advisory services) from the revenue. This approach can be implemented in places where the advisory service is strong and structured, as it is in Israel. The method demands detailed information not only about farm production but also about the performance of advisory services. A strong

[15] If farmers were paying for agricultural advisory services, the value or benefit to them would simply be their market price.

assumption for this type of study is that advisory services are delivered in an efficient and effective way (Gautam, 2000). Holloway and Ehui (2001) and Horna et al. (2005) provide still another indirect way to estimate WTP for advisory services. These methodologies are appropriate for cases in which farmers are not familiar with fees for advisory services. Holloway and Ehui (2001) estimated WTP of dairy producers for individual advisory services visits in Ethiopia. These authors used a traditional consumer model and focused on the cash income constraint to derive the amount of income that the household is willing to forgo in order to have one more additional unit of service rendered. Horna et al. (2005) examined farmers' preferences for seed of new rice varieties and their willingness to pay for information, as an indicator of willingness to pay for advisory services in rice production in Nigeria and Benin. Farmers' preferences were modeled as a function of the utility obtained from rice seed attributes, social and economic characteristics of the farmer, and level of information about the variety. Conjoint utility analysis was used to estimate the marginal values of rice seed attributes and to derive the WTP for seed related information.

Gautam (2000) in Kenya and Sulaiman and Sadamate (2000) in India provide examples of direct WTP for advisory services estimation. In both works, WTP for advisory services was elicited through contingent valuation methods, which are survey-based economic techniques for the valuation of non-market resources, typically environmental areas. In addition, Sulaiman and Sadamate (2000) used a linear discriminant function to predict farmers' behavior and evaluate the determinants of their willingness or unwillingness to pay. The methodology is appropriate when farmers are familiar with fee based advisory services and can give a plausible value. While in India it was already a practice in place to charge fees for advisory services, in Kenya this was a completely new concept.

It is important to note that the message delivered by agricultural advisory services is at least as important as the institutional arrangement chosen to deliver the service. The technologies offered by the advisory service have to create a technological advantage that is sufficient to make farmers "willing to pay"—or even better—"able to pay" (Horna

2005). Willingness to pay is a valuable concept for ex-ante evaluations but it is not enough for a decision to incorporate farmers' financial contributions. An important question then is if the advisory service is increasing farmers' ability to pay. These estimations have been done in sites where farmers' financial contributions have already been implemented (Perraton et al., 1983 in Malawi; Dinar, 1996 in Israel; Currle et al. 2002 in Thuringia; Schmidt, 2005 in Romania).

The contingent valuation method relies on describing a hypothetical situation to the target sample and asking them to state their willingness WTP for desirable change to occur or an undesirable change to occur. First proposed in theory by Ciriacy-Wantrup (1945), contingent valuation surveys became widespread following their use in a quantitative assessment of damages related to the Exxon Valdez oil spill. Despite its widespread use, many economists question the use of stated preference to determine WTP for a good, preferring to rely on people's revealed preferences in binding market transactions. The criticisms were indeed valid, as early contingent valuation surveys were often open-ended questions to elicit WTP or willingness to accept (WTA) compensation for a change in the status quo, potentially suffering from a number of shortcomings, including strategic behavior, protest answers, response bias and respondents ignoring income constraints. In addition, some surveys results seemed to indicate people were expressing a general preference for environmental spending in their answers, described as the embedding effect (Mitchell and Carson, 1989). In response to the criticisms, a panel of high profile economists (chaired by Nobel Prize laureates Kenneth Arrow and Robert Solow) was convened under the auspices of the National Oceanic and Atmospheric Administration (NOAA) in 1993 to hear evidence from expert economists and then put forward a number of recommendations on the design and control including: use of personal interviews as opposed to telephones or mail methods; designing surveys in a yes or no referendum format on a specific WTP/WTA amount; providing detailed information on the resource in question; and careful explanation of income effects (Arrow et al. 1995).

Analyzing the Process of Reforming Agricultural Advisory Services

So far, the framework presented here has been used in a comparative-static way to identify governance structures, management approaches and advisory methods that will improve performance and impact of agricultural advisory systems. However, one cannot assume that the way in which agricultural advisory services are provided and financed can simply be transformed, if the analysis shows that changes would lead to improvements. Changes in governance structures of advisory services, such as decentralization and contracting-out, typically require a political process that involves the executive and legislative branches of government. The introduction of new management approaches and advisory methods requires a process of organizational change and learning within the organization providing the service. Research can play an important role for improving the understanding of such political and organizational processes of change.

(1) In analyzing the *political process of change*, one needs to take into account that the reform of advisory services does not start "from scratch". The system of advisory services already in place—and the economic and political interests associated with that system—have an important influence on the political feasibility of different options for reforming advisory services. In the past, reform strategies for advisory services have been largely dominated by the donor agencies financing advisory services programs, especially in Africa and Asia. The long-term sustainability and success of advisory services reform may, however, depend on a domestic "demand" for such reforms (compare Levy, 2004). Against this background, research on the political dimension of agricultural advisory services reform can support reform efforts by assessing the political feasibility and sustainability of different reform options. Different theoretical approaches are useful to guide this research, including the advocacy coalition framework (Sabatier and Jenkings-Smith, 1993) which pays attention to the policy beliefs of different actors, political resource theory (Ilchmann and Uphoff, 1998) which serves to analyze political power relations, and the policy windows approach (Kingdon, 1984), which focuses on the

timing of reforms. Empirical research methods may include interviews with stakeholders and the analysis of policy documents, including the minutes of parliamentary debates.

As a general policy trend, reform processes are increasingly participatory in nature. Participation by all stakeholders can help to increase the efficiency through using local experts (who are familiar with the local context) and having local priorities incorporated into the reform agenda. Negotiating agricultural policies with stakeholders also supports change by creating ownership, as the example of negotiated pesticide policies in Ghana shows (Gerken, et al., 2001). However, participatory approaches also involve challenges, such as elite capture. In participatory policy processes, action research can become an important research approach, since it may help reform practitioners to systematically evaluate the events and outcomes.

(2) The analysis of processes of *change within organizations* that provide agricultural advisory services can draw on a range of research methods developed in different social sciences disciplines, ranging from organizational sociology and psychology to administrative sciences. Action research that aims at directly supporting the management of change can play an important role in this context. In analyzing change processes within organizations providing agricultural advisory services, the concept of the "learning organization" has gained increasing importance (compare Leeuwis and van den Ban, 2004). By analyzing different reforms of advisory services in a comparative perspective, research can contribute to identifying the conditions that are conducive for transforming agricultural advisory services into learning organizations.

V. CONCLUDING REMARKS

This paper has proposed an analytical framework to guide interdisciplinary studies on agricultural advisory services, with a focus on addressing the challenges of analyzing reform options for pluralistic systems. We also discussed various research methods that can be applied within the proposed framework. It is the hope of the authors that this framework will be useful to guide future research projects that aim at providing policy-relevant knowledge for reforming advisory services. In order to learn more about "best-fit" solutions, it will be useful to apply the proposed framework in different countries, using comparable research approaches and indicators of performance and impact. Ideally, countries should be selected in such a way that one can learn from comparison and from diverse experiences, focusing on the question: What works under which circumstances, and why? In principle, comparing countries with similar types of farming systems/level of development, but different types of advisory services, and *vice versa*, similar types of advisory services applied to different farming systems would be useful. Practically, it will be necessary to start with few countries chosen according to more practical criteria (partnerships, possibility to link up with ongoing reforms of advisory services, availability of funding). However, using a comparable analytical approach will make it possible to compare findings.

The analytical framework covers a wide range of issues to be researched from the perspective of different disciplines. In practice, it may often not be feasible to cover this range of issues in a single research project. However, the framework can be used for combining the research insights derived from different disciplines and research projects in informing reform processes of agricultural advisory services. Ultimately, the authors hope that this framework will support research that helps countries to identify their own best-fit approaches to agricultural advisory services – in this spirit, we expect researchers to adapt and further develop this framework so it best fits their research needs.

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ANNEX 1. TABLES

Table A1. International Reform Initiatives for Agricultural Advisory Services (Rivera and Alex, 2005)

	Governance Structure			Actors involved			Type of Service			Approach		Reform Process		Focus
Case Study	**Decentralization**	**Privatization**	**Contracting**	**Public-Private Partnerships**	**Role of NGOs**	**Producer Organizations**	**Commercial Services**	**Diverse Services**	**Cost Sharing/ Recovery**	**Demand-Driven Programs**	**Participatory Approaches**	**National Strategies**	**Reform Processes**	**Poverty Focus**
Asia														
China	xxx		x			x	x		x					
India	xxx	xxx				x	x	x					x	
Bangladesh	x		x									xxx	xxx	
Nepal	x		x									x	x	
Pakistan				x			xxx					x		
Vietnam	x						x	x				x		xxx
Philippines & Indonesia/FFS						x					xxx	x		
Africa														
Mali		x		x		x	xxx					xxx	xxx	
Niger			x	x	x		xxx					x		x
Benin	xxx		x						x	xxx	x		x	
Ghana	xxx						x			x				
Kenya			x	x				x	x	xxx	x	x		x
Uganda	xxx		x						x	xxx	xxx	xxx	xxx	
Tanzania						xxx					xxx			
Malawi						xxx	xxx							x
Mozambique	x	x	xxx		x							xxx	x	
Zimbabwe	xxx							x		xxx	x	x		
Egypt											xxx	x		
South Africa				xxx			x					x	x	x
Latin America														
Colombia and Latin America				x		xxx				x	x			x
Nicaragua			xxx									x		xxx
Honduras	x		xxx							x		x		
Nicaragua		xxx	X						x		x	xxx	x	
Chile			xxx						x			xxx	x	
Ecuador			xxx			xxx			x	x		x		
Venezuela	xxx		xxx			xxx		x	x	x		x	x	
Brazil				xxx	x	x								
Uruguay		x	xxx							x		x	xxx	
Trinidad and Tobago	xxx												xxx	

xxx: Major element, xx significant element, x: some part of overall reform package
***Source**: Adapted from Rivera and Alex (2005).*

Table A2. Classification of Agricultural Information and Technologies

		Excludability	
		Low	**High**
Rivalry	Low	**Public goods** o Time insensitive production, marketing and management information of wide applicability	**Toll goods** o Time sensitive production, marketing and management information
	High	**Common-pool goods** o Information embodied in locally available resources or inputs o Information on organizational development	**Private goods** o Client-specific information or advice o Information embodied in commercially available inputs

***Source**: Adapted from Umali and Schwartz (1994)*

Table A3. Process Monitoring and Progress Monitoring

Process Monitoring	Progress Monitoring
• Concerned with key processes for project success	• Primarily concerned with physical inputs and outputs
• Measures results against project objectives	• Measures results against project targets
• Flexible and adaptive	• Relatively inflexible
• Looks at broader socio-economic context in which the project operates, and which affects project outcome	• Focuses on project activities/outcomes
• Continuous testing of key processes	• Indicators usually identified up front and remain relatively static
• Selection of activities and processes to be monitored is iterative, i.e., evolves during process of investigation	• Monitoring of pre-selected indicators/activities
• Measures both quantitative and qualitative indicators, but main focus is on qualitative indicators	• Measures both qualitative and quantitative indicators, but main focus is on quantitative indicators
• A two-way process where information flows back and forth between field staff and management	• A one-way process where information flows in one direction, from field to management
• People-oriented and interactive	• Paper-oriented (use of standard formats)
• Identifies reasons for problems	• Tends to focus on effects of problems
• Post-action review and follow-up	• No post-action review
• Includes effectiveness of communication between stakeholders at different levels as a key indicator	• Takes communication between stakeholders for granted
• Is self-evaluating and correcting	• Is not usually self-evaluating and correcting

***Source**: World Bank, 1999*

Table A4. Complementary roles for monitoring and evaluation

Monitoring	Evaluation
▪ Routine collection of information	▪ Analyzing information
▪ Tracking project implementation progress	▪ Confirming project expectations
▪ Measuring efficiency	▪ Ex-post assessment of effectiveness and measuring impact
▪ Question: "Is the project doing things right?"	▪ Question: "Is the project doing the right things?"

***Source**: Alex and Byerlee (2000)*

ANNEX 2. ADVISORY METHODS AND MODELS

1) Transfer of Technology Models

This approach focuses on using the advisory service for the transfer of technologies that are generated at research stations. Since a variety of methods and media can be used for this purpose, "transfer of technology" describes a perspective, rather than a specific set of methods. The limitations of this "linear" and "top-down" perspective of advisory services have been widely recognized since the 1980s (e.g., Chambers and Ghildyal, 1984), which has led to the development of models in which the farmer is not just considered as a recipient of technologies generated in research stations.

2) Training and Visit (T&V)

The T&V approach was developed by the World Bank and, as mentioned in the introduction, promoted in approximately 50 countries until the mid-1990s. In terms of the framework presented here, T&V is not only a set of advisory methods (Box A), it also prescribes an organization and management approach (Box M) and a governance structure (Box G). T&V entailed a hierarchical organizational structure of several levels, a rigid bi-weekly schedule of visits to a defined fixed list of contact farmers (later modified to contact groups), regular interaction with subject-matter specialists (researchers), and a concentration on the most important crops (Anderson, Feder and Ganguly, 2005).

3) Participatory Approaches

Starting from the critique of the transfer of technology model, a range of approaches that are classified as participatory have been developed since the late 1970s, which emphasize the active role of the farmers not only in advisory services, but also in the research process. Participatory approaches are guided by the "Farmer-First" philosophy (Chambers, 1983). Participatory research approaches include, for example, the "On-Farm Research with Farming Systems Perspective" of CIMMYT (OFR/FSR). The innovation systems approach (Section 2) emphasizes the need to include not only

farmers, but a wider set of stakeholders in the development of new technologies (innovative linkage model). Advisory approaches that are classified as participatory often include farmer experimentation. Figure A1 illustrates the methods used for a community-based participatory advisory service approach (PEA) developed in Zimbabwe, which emphasizes social mobilization, facilitation and learning (Hagmann et al., 1999). A comprehensive evaluation of a participatory group extension approach in Egypt is provided by Hannover and El Wafa (2003). The experience with participatory approaches shows that it is not only important to foster the self-organization of various interest groups for their coordination at community level, but also to support their representation in different development fora for linking with service providers and political structures at municipal and provincial levels (local organizational development- LOD). This implies that the micro-meso linkages are important, accompanied by intervention at the macro-level, when required (Ficarelli, 2005).

4) Farmer Field Schools (FFS)

Farmer Field School (FFS) programs were developed by the Food and Agriculture Organization (FAO) and first introduced in East Asia in the late 1980s as a way of diffusing knowledge-intensive Integrated Pest Management (IPM) practices for rice. FFS have since been adapted to other content areas and have spread rapidly across Asia, Africa, and Latin America (Nelson et al., 2001). FFS is a group advisory process based on non-formal adult education methods, focusing on field observations, season long research studies and hands on activities. The underlying comprehensive adult education concept is in fact a distinguishing feature of the FFS approach. FFSs aim at empowering farmers to be their own technical experts on major aspects of localized farming systems. It has been described as a paradigm shift in agricultural advisory services: the training program utilizes participatory methods "to help farmers develop their analytical skills, critical thinking, and creativity, and help them learn to make better decisions" (Kenmore, 2002).

5) ICT-based Models

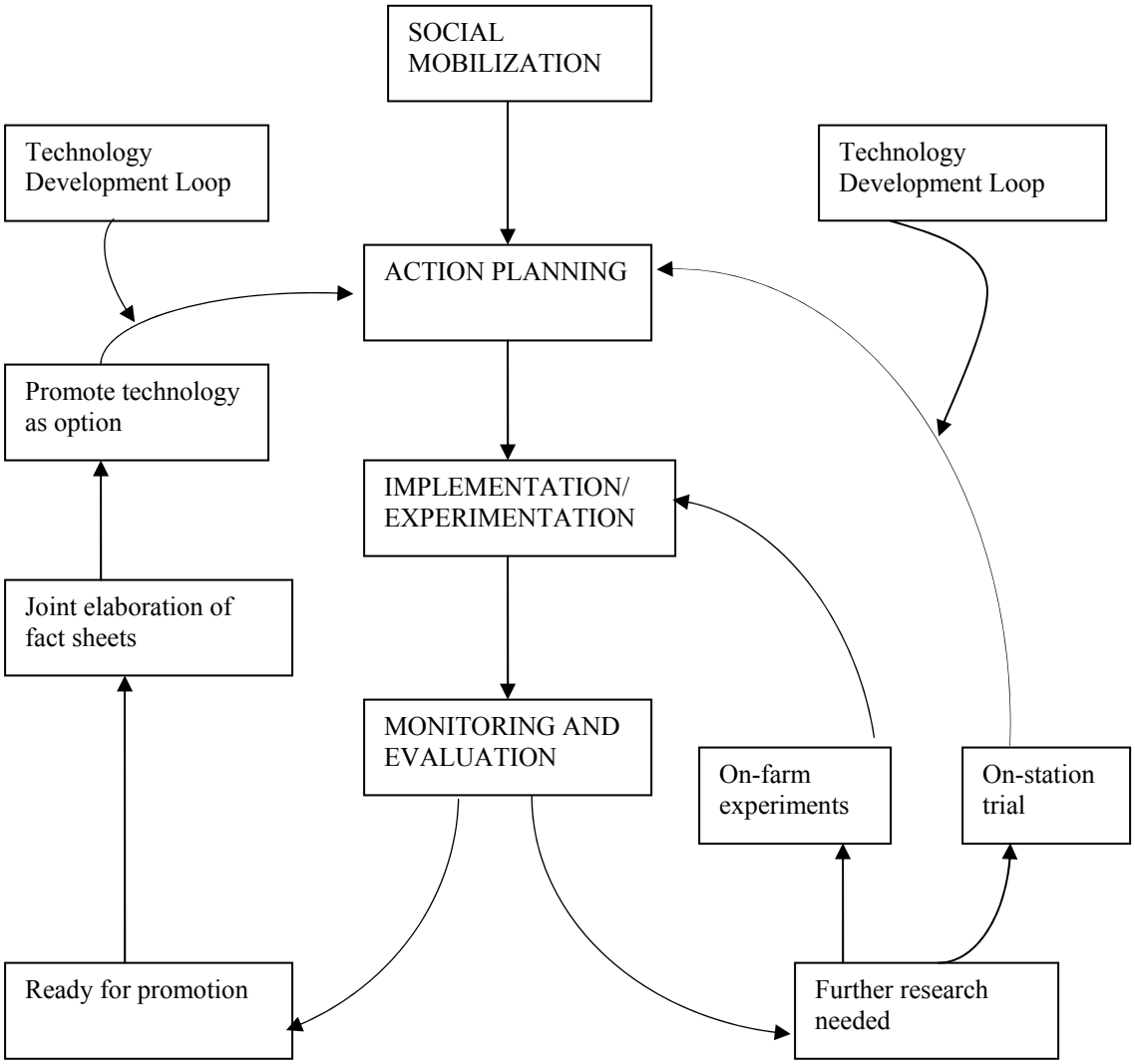
While ICT-based models of advisory services, such as online advice, have become common in industrialized countries, these technologies also have a considerable potential for developing countries. An interesting approach is the *eChoupal* model in India, which has been developed by the Indian Tobacco Company (ITC). An *eChoupal* are village internet kiosk run by a local farmer, which helps villagers to access free of charge information on farm practices, weather, and prices of inputs, services and outputs. This model was launched in 2000 and now comprises 4,000 *eChoupals* serving 2.5 million farmers in six states (Umali-Deininger, 2005). Another example of using the internet in India is the fee-based *nLogue* model of Ulagapitchampatti. Farmers can show crops affected by diseases to a web camera and receive advice on treatment (Bhatnagar, 2005).

6) Other Models

There is a variety of other models of providing advisory services, such as the school approach (e.g., demonstration plots in schools and discussions held during parents' days) and the strategic extension campaign approach (which concentrates on priority problems identified by farmers). Model farms constitute another approach, which has been widely used to promote new technologies, especially in Asia. One example where model farms were used is the introduction of the wheat-maize double cropping system on Hebei Plain in China.[16] In Thailand, organic farming has been promoted through model farms that could be visited not only by farmers, but also by consumers and media representatives (Fischer, 2004). Some specific advisory service approaches have been developed to address problems of natural resource management, such as the catchment approach (designed to address problems in watersheds), or participatory land use planning approaches (which include, e.g., the use of three-dimensional landscape models).

[16] http://www2.essex.ac.uk/ces/ResearchProgrammes/SAFEW47casessusag.htm.

Figure A1. Community-based Participatory Extension Approach: Process and Feedback Linkages



***Source**: AGRITEX, 1998*

ANNEX 3. METHODOLOGICAL ISSUES IN ECONOMIC IMPACT ASSESSMENT

This annex discusses different methodological strategies to meet the challenges of economic impact assessment of agricultural advisory services. The impact of advisory services on crop yields is used as an example to illustrate these strategies. As stated in Section 4.2, holding all else constant, the impact of advisory services on crop yield for farmers participating in the advisory services program (average treatment effect on the treated (ATET)), is given by

$$ATET_i = E(Y_{ei} - Y_{wi} | X_i, P_i = 1) \quad \ldots\ldots\ldots\

econometric approaches in this case (since $(Y_{wi}|X_i, P_i=0)$ is observable for control households).

Despite the advantages of social experiments, there are, however, several drawbacks to this approach. Social experiments can raise ethical and political concerns about treating people "like guinea pigs," especially when poor people who would otherwise be eligible are denied access to program benefits by random assignment (Ravallion 2005).[17] Random assignment presupposes control by the program supplier over who participates and the nature of the "treatment" of participants. This may conflict with the increased emphasis on making agricultural advisory services programs and many other development programs demand-driven and participatory in nature. Insisting on random assignment can change the nature of the program intervention, causing it to cater to a different population than would otherwise be served, limiting the use of information by program managers about which communities and households are most likely to benefit from a program or which interventions are likely to be most useful, or changing the ways in which the program responds to local demand.[18] Even where random assignment is possible, selected participants may choose not to participate or may drop out of the program, while control households may substitute for program participation through other activities.[19] These responses cause biases in the estimated treatment effects, requiring non-experimental approaches to correct (Ravallion 2005; Heckman, et al.,

[17] A counterargument is that if a program is in an initial phase in which not all eligible households will benefit, use of an experimental approach to reliably document the impacts of the program can improve the design and performance of subsequent phases and strengthen political support for scaling out the program. Some also argue that randomized assignment may be fairer than some other methods of deciding who will benefit from programs, which often are biased to elite groups (Ravallion 2005).

[18] Heckman and Smith (1995) refer to these types of problems as "randomization bias". In principle, concerns related to heterogeneous responses of beneficiaries to programs and use of program managers' information about this could be addressed by having program managers codify their information and use this to select control and treatment households using a stratified random assignment (Elizabeth Sadoulet, personal communication). However, much information used by program managers may be implicit and difficult to codify, and decisions about program participants and activities may be the result of an endogenous process of negotiation and adaptation to local conditions. Evaluation of a program using random assignment may thus represent a program quite different than an actual program as it would have been implemented.

[19] Problems of dropout may be greater for advisory services programs, especially if they are supply driven, than for programs offering immediate benefits, such as conditional cash transfer programs, for which experimental approaches have been used in several cases (e.g., Skoufias 2005).

forthcoming). Furthermore, social experiments are usually limited in their ability to provide information about heterogeneous impacts of program interventions in different contexts, about impacts of sequential interventions, and about the structural relationships necessary to draw implications beyond the impacts of a specific program in a specific location (Ibid.). Other approaches are needed to address these issues.

2) Non-experimental Methods

Non-experimental methods to deal with the challenges of impact assessment include regression methods, propensity score matching, and double difference and fixed effects estimators.

Regression Methods

Parametric regression methods assume a parametric form of the functions $(Y_{ei}|X_i, P_i)$ and $(Y_{wi}|X_i, P_i)$. Linear models are often assumed:

$$Y_{ei} = X_i\beta_e + u_{ei} \quad \ldots\ldots\ldots\

= $E(u_{wi}| X_i, P_i)=0$. This condition means that the unobserved factors affecting the outcome—whether the household is participating or not—are independent of the choice to participate and the observable control variables (X_i). This condition may not be satisfied because of the non-random nature of participation decision; e.g., people may choose to participate in advisory services in part because of unobserved factors that also influence the outcome (like land quality or the farmer's ability). This is referred to as the problem of "selection on unobservables" (Ravallion 2005). The condition may also not be satisfied because the control variables are endogenous. For example, it is common to estimate equation (5) for impacts of advisory services using a production function specification, in which endogenous inputs are included as control variables (Bindlish and Evenson 1997; Gautam and Anderson 1999; Anderson and Feder 2005). Farmers' decisions about amounts of inputs to use may well be correlated with unobserved (by the evaluator but not the farmer) factors that also affect yields (e.g., decisions about fertilizer use may depend upon weather early in the planting season). Although assessments of the impacts of advisory services commonly address concerns about endogeneity of program participation (e.g., by using indicators of community level access rather than household participation), they often ignore the problem of endogenous inputs (e.g., Bindlish and Evenson 1997; Gautam and Anderson 1999), which can also bias conclusions about program impact. These problems can be addressed using instrumental variables (IV) estimation (also known as two-stage least squares estimation).

IV estimation essentially involves predicting the endogenous explanatory variables using variables that are assumed to be exogenous (uncorrelated with the error term), and using the predicted values in equation (5). Since those predicted values are based on exogenous variables, they are also exogenous, thus avoiding the bias present in OLS estimation. To be estimable, there must be some instrumental variables used to predict the endogenous variables that are excluded from the model in equation (5), since otherwise perfect multicollinearity between the predicted endogenous variables and the

other explanatory variables prohibits estimation.[21] Other problematic requirements of IV estimation are the need to assume that (at least some) instrumental variables are exogenous and the need to assure that they are strong predictors of the endogenous explanatory variable. Statistical exogeneity tests can be used to test the exogeneity of selected instruments, but these tests require that the model be identified, which requires that at least some instruments are assumed to be valid (Ibid.; Davidson and Mackinnon 2004). Statistical "relevance" tests can be used to establish the strength of the instruments; if instruments are weak, IV estimation can be more biased than OLS (Bound, et al. 1995).

Identifying suitable instrumental variables that can be validly excluded represents a major challenge for IV estimation. Where program placement is randomly assigned, the assignment can be used as an instrumental variable for participation, even if actual participation is affected by household decisions (Ravallion 2005). If program placement is not randomly assigned, suitable instruments may still be found if the timing of program implementation is delayed for some beneficiaries, and the delays are randomly assigned (Ibid.). Suitable instruments may also be based upon geographical considerations in program placement (e.g., distance to services as an instrument for use of services (Attanasio and Vera-Hernandez (2004), political considerations (e.g., presence of women in state parliaments as an instrument for availability of workers' compensation insurance (Besley and Case (2000)), or discontinuities in the program design (e.g., cutoff levels for program eligibility based on variables whose impact on outcomes are otherwise expected to be continuous, such as effects of the amount of land owned on eligibility for participation in a credit program, assuming that land owned has a continuous impact in absence of such a program (Pitt and Khandker 1998)). In general, a much stronger

[21] Exclusion restrictions are not strictly necessary in non-linear models, since the problem of identification results from linear correlation between predicted endogenous variables and other variables. For example, if program participation is predicted by a non-linear binary response model such as a probit or logit, the model in equation (5) can be estimable by IV (taking the predicted participation as an instrument) even without exclusion restrictions (Ravallion 2005). Nevertheless, lack of excluded instruments usually results in poor identification of the model due to a high degree of (but not perfect) multicollinearity. Furthermore, many analysts object to identifying a model solely based on nonlinearity, since the model results may not be robust to violations of the nonlinear parametric assumptions (Ibid.).

argument in support of exclusion restrictions is currently expected by reviewers of evaluation studies than used to be the case, and this typically requires detailed knowledge of the program and its context (Ravallion 2005).

Another concern with regard to IV estimation is that it does not provide a full measure of impact, but rather only the impact resulting from variation in the instrumental variables (Ibid.). For example, if differences in geographical access to a program are used as instruments for participation in the program, the resulting estimates reflect only the effects of the part of participation that is due to geographical access. The effects of program participation in areas of similar geographical access will not be reflected.

Beyond these concerns, both parametric OLS and IV estimation are beset by problems related to the parametric assumptions used, and potential biases caused by comparing non-comparable units. The validity of results of linear OLS and IV models depend upon the validity of the linear functional forms.[22] Such problems can be addressed by testing restricted linear models against more general nonlinear or non-parametric models, although the data requirements of more general models can be considerable (i.e., they generally require larger data sets to estimate a larger number of parameters, and are often beset by problems of multicollinearity).

The problem of comparing non-comparable units is potentially quite serious, but not usually recognized in the econometrics literature. Heckman, et al. (1998) showed that the bias in a non-experimental evaluation can be decomposed into three components: 1) bias resulting from the fact that for certain participants there are no non-participants with comparable observable characteristics, and *vice versa* (called a "lack of common support" for the participants and non-participants), 2) differences in the distribution of observable characteristics within the region of common support, and 3) selection on unobservables as conventionally defined. Using data from an experimental study of impacts of a job

[22] These estimators are fairly robust to assumptions about the distribution of the error term, provided that the error is additive and independently and identically distributed, since they are asymptotically normally distributed under fairly general conditions (Amemiya 1985). Even violations of the independence and identical distribution assumption (such as clustering and heteroscedasticity) do not cause coefficient estimates in linear regression models to be biased (although they are inefficient), although estimates of standard errors must be adjusted (Stata 2004).

training program, Heckman, et al. (1998) were able to estimate the magnitudes of these biases and found that the conventional selection bias was much smaller than the other two sources of bias. The lesson is that it is important to try to assure that program participants and non-participants are as similar as possible in order to avoid large biases.

Propensity Score Matching

One common non-experimental method of addressing this bias is propensity score matching (PSM). Propensity score matching involves predicting the likelihood of being a program participant, then identifying a subset of the non-participants that are as similar as possible in their likelihood of participation to each participant. The propensity scores may be predicted by parametric models such as probit or logit, or by a non-parametric qualitative response model (Ravallion 2005). Then for each participant observation, the "nearest neighbor" or set of nearest neighbors among non-participants is selected for comparison, and the mean difference between the participants and matched non-participants is used as the measure of ATET.[23] A region of common support is assured by including only participant observations that have comparable non-participant observations with sufficiently similar propensity score.

The PSM method attempts to replicate the effects of random assignment by assuring that comparisons are made between households that are similar, at least in terms of observable characteristics that influence participation. It also avoids the use of parametric assumptions concerning the nature of the relationship between Y_i and X_i, although it may involve use of a parametric model to predict participation.[24] Although PSM accounts for observable factors affecting program participation ("selection on observables"), it is subject to bias due to selection on unobservables, since it relies on conditional independence of the unobservables from the observable variables and participation decision. In this regard PSM has the same shortcoming as OLS (but not IV

[23] If a set of comparator nearest neighbor non-participants is used, a weighted average of their scores on the outcome variable is used in general, with different weighting schemes possible (e.g., equal weights for N nearest neighbors, or non-parametric kernel weights that are maximal for the nearest neighbor and decline for more distant observations in terms of the propensity score).

[24] Ravallion (2001) argues that results of PSM are not very strongly affected by parametric assumptions about the determinants of the propensity score.

estimation), although it is better than OLS and IV estimation (as usually applied) in assuring comparability of participants and non-participants in terms of observable characteristics, thus reducing another source of bias. Unfortunately, the different sources of bias may have opposite signs, so there is no assurance that reducing one source of bias results in a better estimate of impact (Ibid.). Studies of the performance of PSM show mixed results, with some studies showing that PSM can achieve a good approximation to experimental results, while others find that the performance of PSM depends greatly on the quality and comparability of the data used (Ibid.). Since PSM is subject to selection bias due to unobserved factors that jointly affect participation and outcomes, the validity of the results depend heavily on the completeness of the set of variables used to predict participation (as with OLS).

Another problem with the PSM method is that it typically requires a large dataset to obtain matching values for observations of participants, and it may prove difficult to find matching non-participant observations for observations with high propensity scores (since those with high scores are likely participating). This can lead to truncation of the sample of participants in the analysis, which can introduce sampling bias and create ambiguity about the population that the estimated impact results apply to.

It is possible to combine the advantages of PSM and IV estimation, using propensity scores to select a sub-sample representing a region of common support, and then use IV estimation to address the issue of selection on unobservables, though this still faces the sample truncation problem. A simulation study by Rubin and Thomas (2000) found that regression impact estimates based on the full unmatched sample were more biased and more sensitive to misspecification of the regression function than those based on a matched sub-sample. Thus combining these methods may lead to better results.

Double Difference and Fixed Effects Estimators

Another method of addressing the problem of unobserved heterogeneity is the use of double difference or fixed effects estimators. The double difference (DD) estimator is formed by computing the means of the outcome indicator for four groups of observations:

participants and non-participants before and after the program. The difference between mean outcomes of participants and non-participants is computed for both time periods, and the difference between these differences is the estimator of ATET. The assumptions required for this model to correctly identify ATET are that 1) the selection bias is additively separable and time invariant and 2) the outcomes prior to program are not influenced by expectations about program placement (Ravallion 2005). If these assumptions hold, the selection bias reflected in comparing the means in the second period will be subtracted out.

With panel data observations from multiple time periods for the same households, the DD method can be generalized using a fixed effects regression, including individual and time period fixed effects (Ibid.). Panel data are not necessary to use the DD method, however; repeated cross section survey data can also be used, as long as the survey instruments are comparable and statistically representative samples are drawn for both groups in both periods. However, if panel data are available, other types of analysis are possible, such as investigating impacts of programs on poverty dynamics.

If the mean outcomes for the non-participant group are unchanging over time, the DD estimator reduces to a reflexive before-after comparison for the participants. This emphasizes the additional assumption required for such before-after comparisons to produce a valid estimate of ATET; namely that outcomes are changing over time only because of the program. This is obviously a very strong assumption that is likely to be violated in reality.

If data are available only after the program on participants who stayed with the program vs. those who left, a triple-difference estimator (difference between the double difference estimator for stayers and leavers) may be able to estimate the ATET, under certain identifying assumptions (Ibid.).

The assumptions of the DD (and fixed effects) estimator may be violated in many situations. For example, the productivity and incomes of participant and non-participant households may have be growing at different rates (absent any program impact) as a

result of differences in initial levels of human capital or other endowments between these two groups. As a result, the selection bias would be changing over time, leading to biased conclusions from the DD method (Ibid.). These problems can be reduced by combining propensity score matching with a DD estimation, to ensure that the participant and non-participant comparison groups are as similar as possible (in terms of observable characteristics) prior to the program. Of course, there still may be differences in growth rates resulting from differences in unobserved characteristics of the two groups, which this method would not address.

DD designs are particularly vulnerable to data quality problems, since measurement errors are likely to be greater relative to the magnitude of changes over time than measurement errors relative to levels of variables.[25] Thus, there may be a tradeoff between the desire to use DD to reduce the problem of selection on unobservables, and problems of bias and imprecision caused by measurement errors.[26]

Another potential problem is that if a double difference version of equation (5) is estimated, changes in explanatory variables may be endogenous decisions during the period of study, whereas levels in a particular year may not be. For example, if X_i includes assets at time i, these may be predetermined and hence exogenous with respect to the error term in equation (5), but changes in assets between two time periods are determined by endogenous investment decisions, which may be correlated with changes in unobserved factors affecting outcome measures. In this case, IV estimation may need to be combined with the DD method.

[25] This concern follows from the fact that the variance of the difference between two independent random variables is the sum of the variances of the two variables. Thus, if μ_1 and σ_1^2 are the mean and variance of Y_1,μ_2 and σ_2^2 are the mean and variance of Y_2, and Y_1 and Y_2 are independent, then the coefficient of variation of Y_2–Y_1 (CV, the standard deviation divided by the mean) is equal to $(\sigma_1^2 + \sigma_2^2)^{1/2}/(\mu_2 - \mu_1)$, which is larger than the CV for either Y_1 or Y_2.

[26] Measurement errors in the dependent variable of a regression do not cause bias, as long as they are not correlated with the explanatory variables, but they do reduce the precision of the estimates (Greene 1990). Measurement errors in explanatory variables cause bias in estimated coefficients (Ibid.).

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35. *Public Investment to Reverse Dutch Disease: The Case of Chad* by Stephanie Levy, July 2006

34. *Moving Up and Down: A New Way of Examining Country Growth Dynamics* by Marc Rockmore and Xiaobo Zhang, June 2006

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29. *The Role of Agriculture in Development: Implications for Sub-Saharan Africa* by Xinshen Diao, Peter Hazell, Danielle Resnick, and James Thurlow, February 2006

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