





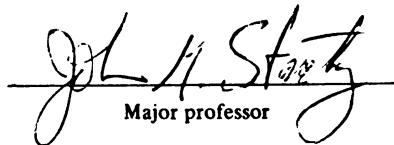
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**A FRAMEWORK FOR ANALYZING ALTERNATIVE INSTITUTIONAL  
ARRANGEMENTS FOR THE CEREALS MARKET INFORMATION SYSTEM  
IN MALI**

**By**

**KIMBERLY M. ALDRIDGE**

**A THESIS**

**Submitted to  
Michigan State University  
in partial fulfillment of the requirements  
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## **ABSTRACT**

### **A FRAMEWORK FOR ANALYZING ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR THE CEREALS MARKET INFORMATION SYSTEM IN MALI**

**By**

**Kimberly M. Aldridge**

Institutional and environmental changes alter the opportunity sets and transacting domains of economic actors, thus pressuring economic organizations to evolve. Reform policies like liberalization of the grain trade in Mali increased the demand from both the private and public sectors for reliable and timely dissemination of information and analytical products. Organizational changes within the Malian grain market information system, the SIM, would help it to meet user needs better. Many institutionalists believe that contractual choices (i.e., organizational arrangements) have transaction-cost roots. Using transaction-cost economics, this study develops a framework for analyzing alternative organizational arrangements of the SIM in Mali. After examining both theoretical and empirical issues that influence the organization of the production of market information products, a transaction-cost (TC) framework is advanced.

**To my family - may one of you be inspired**

**and**

**to John Staatz - for whom I wanted to do my very best**

## ACKNOWLEDGMENTS

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### **List of Acronyms**

|              |  |
|--------------|--|
| <b>ACDI</b>  | Canadian International Development Agency  |
| <b>CESA</b>  | Commission Nationale d'Evaluation et de Suivi de la Stratégie Alimentaire, National Food Strategy Evaluation and Monitoring Commission, counterpart Malian agency for the MSU Food Security Project. |
| <b>CFAF</b>  | CFA Franc, unit of currency used by member countries of the West African Monetary Union, including Mali, convertible with the French Franc at 1FF = 50 CFAF.   |
| <b>CILSS</b> | Comité Inter-états de lutte contre la Sécheresse dans le Sahel, Interstate Committee for Drought Control in the Sahel, organization of Sahelian states coping with drought.                          |
| <b>CMDT</b>  | Compagnie Malienne de Développement des Textiles, Malian ODR for the promotion of cotton.  |
| <b>CNAUR</b> | Comité National d'Actions d'Urgence et de Réhabilitation, Malian agency concerned with emergency aid and rehabilitation activities.  |
| <b>DNAE</b>  | Direction Nationale des Affaires Economiques, agency formerly charged with enforcement of grain price regulations.   |
| <b>DNSI</b>  | Direction Nationale de la Statistique et de l'Informatique, National Department of Statistics.   |
| <b>ENA</b>   | Ecole Nationale d'Administration, National School for Administration.  |
| <b>ENSUP</b> | Ecole Nationale Supérieur, National Teachers Training School.  |
| <b>FAO</b>   | Food and Agricultural Organization of the United Nations.  |
| <b>FEWS</b>  | Famine and Early Warning System, USAID.  |
| <b>IER</b>   | Institut d'Economie Rurale, Rural Economics Institute.   |
| <b>IPR</b>   | Institut Polytechnique Rurale, Rural Polytechnical Institute   |
| <b>MIS</b>   | Market Information System.   |
| <b>MSU</b>   | Michigan State University.   |
| <b>ODR</b>   | Opération de Développement Rural, geographically focused integrated rural development project(s) specializing in cereals and/or cash crops.  |

|              |  |
|--------------|--|
| <b>OPAM</b>  | Office des Produits Agricoles du Mali, cereals marketing agency of Mali.                                     |
| <b>PRMC</b>  | Programme de Restructuration du Marché Céréaliier, multi-donor program guiding grain market liberalization.  |
| <b>RAC</b>   | Radio communication system.  |
| <b>RTM</b>   | Radio and Television of Mali.  |
| <b>SAP</b>   | Système d'Alerte Précoce, Early Warning System, Mali.  |
| <b>SIM</b>   | Système d'Information sur le Marché céréaliier, grain market information and analysis unit operated by OPAM. |
| <b>SNS</b>   | Stock National de Sécurité, strategic grain reserve operated by OPAM.  |
| <b>TC</b>    | Transaction costs.   |
| <b>USAID</b> | United States Agency for International Development.  |

## **CHAPTER 1**

### **INTRODUCTION AND RESEARCH CONTEXT**

#### **1. Introduction.**

Cereals production in Sub-Saharan Africa plays the dual role of guaranteeing availability of and access to foodgrains. Indeed, in agricultural sectors dominated by subsistence farmers, food security involves questions of both supply and access, i.e., farmers derive their entitlement from food production and through market integration. Much of the food security research has shown that some farming households get some of their food from home production while many households depend on the market for part of their consumption requirements<sup>1</sup>. Thus, improving the efficiency of the marketing system (its ability to deliver food to net buyers at a reasonable cost and its reliability as an outlet for surplus production) is critical for strengthening both sides of the "food security equation". Improved market information enhances market efficiency by:

- a. improving the flow of food access across time and space (better spatial and temporal arbitrage);
- b. strengthening the bargaining power of more dispersed groups in society, especially farmers and consumers, thereby raising their incomes and their ability to acquire food through the market;
- c. reducing risks for market participants, thereby encouraging greater investment in the marketing system.

A major hypothesis underlying cereals market reform in Mali is that improved predictability will induce farmers to increase the quantity of foodgrains marketed, encourage traders to invest in the marketing system and ultimately reduce real food prices for consumers. By disseminating reliable and timely market information, a market information system (MIS) can improve the predictability of the market. In general,

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<sup>1</sup> See, for instance, Dioné 1989.

market information systems aim to increase market transparency (i.e., access to information relevant for rational production, marketing and consumption decisions). Market transparency in turn signals market opportunities, stimulates competition, and decreases seasonal and erratic price variations and associated risks. Similarly, improved capacity to monitor market developments is critical to designing effective food policies. This is particularly important in Mali, where the cereals markets are evolving very rapidly in response to liberalization. The MIS plays a key role in helping to provide the data and analysis that informs government and donor food policy decisions in Mali.

Moreover, in dynamic economies, market information systems are not only requisite, but must also evolve to keep pace with the changing structure of the economy and the evolving needs of economic agents. Consequently, market information systems need a framework to analyze trade-offs among the various ways to continually restructure themselves. The purpose of this paper is to provide such a framework.

### **1.1 Problem Statement**

In 1988, in an effort to make the cereals market more transparent and encourage private-sector investment in the cereals subsector, the Malian government, with donor support, implemented a market information system. The SIM (Système d'Information du Marché)<sup>2</sup> was conceived as a coordinating unit that would centralize, process, analyze and disseminate timely market information<sup>3</sup>. However, since its inception, user

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<sup>2</sup> SIM is a French acronym for market information system, and is used throughout this study to refer specifically to the Malian cereals market information system, while the acronym MIS refers to market information system in a general context.

<sup>3</sup> To date, the SIM is regularly collecting and disseminating only price information, although some information on quantities of grain available in certain markets has been collected. Methods for obtaining more reliable quantity information were being tested in

demand has gone beyond the system's ability to supply information in the short run. Policy makers would like to see more in-depth analysis, while traders would like the SIM to provide information on quantities, export potential and prices. According to Dembélé et al. (1990), if the current system tries to respond to these new demands in the short run, it runs the risks of compromising the reliability of its basic information and delaying its dissemination. Thus, the challenge becomes one of re-organizing the SIM to meet user needs better.

The primary goal of this paper is to develop a framework for analyzing the trade-offs of alternative organizational arrangements that would allow the SIM to respond to increasing and evolving demands. Organizational arrangement refers to the organizational structure of the different functions of the market information system. For example, what are the trade-offs of organizing data collection and analysis in one institution relative to organizing these services in separate specialized structures such as the National Agricultural Statistical Service (NASS) and the Economic Research Service (ERS) in the U.S. model? Or should the production of analytical products (e.g., outlook reports) be organized through cooperative agreements with, for instance, the local research institutions or the schools of higher learning? Will the analytical product produced through such an arrangement be readily available and useful to the private sector? In addition to these production questions (how to organize the production of market information), the demand side must also be carefully analyzed, since the organization of the production of market information has an impact on how the product will be demanded. For example, would the output of the SIM - the information product

- be respected and believed [demanded] if, for instance, the DNAE, the Malian grain trade policing agency, were the providing agency?

To analyze the trade-offs involved in these alternatives, a conceptual and analytical framework must be developed. A framework is defined as "a frame or structure composed of parts fitted and joined together; a skeletal structure designed to support or enclose something" (Random House Dictionary 1988). This paper aims to identify the "parts" and join them together using transaction cost theory to develop such a skeletal structure. Towards this end, this paper is divided into six chapters.

The remainder of this chapter outlines the objectives of the study as well as sets the context, including a brief description of the Malian environment. Chapter 2 discusses the theoretical issues that influence the organization of the supply and demand for market information and delineates the fundamental components of a market information system. Since transaction-cost analysis is the analytical method used to analyze the trade-offs among alternative organizational arrangements, a brief discussion of the theory underlying transaction costs economics is also included. After examining empirical evidence and lessons learned from other country experience with MISs, chapter 3 discusses factors that facilitate or constrain the performance of the MIS, in effect generating design guidelines. Chapter 4 describes the Malian information subsector - the relevant institutions currently involved in collecting and analyzing market information and the role of the SIM in the broader constellation of the subsector. By confronting the theoretical issues discussed in chapter 2 with the empirical evidence elaborated in chapters 3 and 4, chapter 5 identifies the trade-offs and transaction costs implied by alternative organizational arrangements of an MIS in the context of the Malian information subsector. Using alternative organizational scenarios, chapter 5 formalizes

and applies the framework. Chapter 6 summarizes the findings of the analysis and discusses their implications for the evolution of MISs.

## **1.2 Study Objectives**

There are few explicit guidelines for reorganizing or devising alternative institutional arrangements for improving food system performance. Based on theoretical and empirical evidence, this paper develops an analytical framework for analyzing the trade-offs of alternative organizational arrangements aimed at creating more responsive market information systems. The specific objectives of this research are to:

- A. Briefly examine the importance of market information systems in general as a policy instrument to improve food system performance.
- B. Assess the current status of the Malian market information system.
- C. Assess the current related institutional capacity in Mali to provide market information services.
- D. Develop MIS design guidelines.
- E. Develop a framework for analyzing alternative strategies for organizing the MIS in Mali.
- F. Discuss the implications of this analysis for food security policy.

## **1.3 Sources of Information**

The information presented in this paper is drawn from the literature on the economics of information, information system design, food security and market liberalization and transaction-cost economics. Michigan State University, through the Food Security in Africa Cooperative Agreement with USAID, has been heavily involved in the development, implementation and evaluation of the Malian market information system. Therefore, much of the secondary information is derived from documents

produced during this research project. Informal interviews with SIM employees currently studying at Michigan State University also contributed to the paper.

#### **1.4 The Malian Environment: Some Socio-Economic Statistics**

It is important to understand the basic structure or environment that the Malian market information system aims to serve. Thus, this section will give a brief country synopsis by describing the agricultural sector, infrastructure and communication facilities in Mali.

##### **1.4.1 Overview of Malian Economy**

With a 1987 per capita income of US \$210 (CILSS 1991), Mali, a landlocked nation in the Sahel region of West Africa, has 1,241,231 square kilometers and is mostly desert (DNSI 1991). In 1989, there were 8.09 million inhabitants who primarily populated the southern third of the country. Forecasts from 1967-1988 figures indicate that the population is growing at an average annual rate of 2.4 percent (CILSS 1991). Indeed, in the more productive agricultural areas, concerns about population pressure and environmental degradation are growing. Furthermore, based on 1987 figures, 46% of the total population is age 14 and under, while 55.5% is aged 19 and under (DNSI 1991).

Endowed with relatively few natural resources, the economy is overwhelmingly agricultural, with 70 to 80 percent of the total population inhabiting the rural areas, gaining much of their livelihood from agricultural and livestock activity (Dioné 1989; 1990; CILSS 1991; DNSI 1991)<sup>4</sup>. The agricultural sector, dominated by small-holders,

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<sup>4</sup> Including fishing, crops, livestock and forestry.



employs approximately 75% of the active population and contributes 50% to GDP (Ibid.). Produced under rainfed conditions, coarse grains constitute the principal foodcrops, while some paddy rice is produced under irrigated schemes<sup>5</sup>. Agricultural production, though very irregular, is growing at an annual rate of 3%; this is primarily the result of good harvests obtained between 1985 and 1989 (CILSS 1991, p.3). Foodgrains are traditionally not heavily marketed. Farmers in the higher rainfall areas generally give first priority to trying to meet the bulk of their families' grain consumption needs through home production. They tend to sell cereals under the following conditions: when the volume produced is in excess of the farm family's own consumption requirements, or when the surplus is small, but the risks of food shortage in the coming crop season are slight, or when the sale of these foodgrains is the only opportunity to gain financial resources (CILSS 1991, p.4).

On the consumption side, the annual estimated consumption of grain in Mali is 188 kg per capita (Dioné 1989), and approximately 80% of cereals produced are consumed on the farm (Mehta 1989). Additionally, coarse grains make up 84% of the average rural diet, while approximately 50% of urban cereals calories come from rice (Rogers and Lowdermilk 1988, p.1). Prior to the banning of rice imports in 1988, cereals accounted for 97% of food imports, of which rice represented a large share. Before 1988, food imports varied between 2 and 64% of export earnings (Gabre-Madhin 1991, p.9)

Mali's principal foreign exchange earners include cotton and livestock, which accounted for an average of 69% of the 1986-1988 export revenues (CILSS 1991, p.64).

---

<sup>5</sup> Coarse grains in the Malian context refer to millet, sorghum and to a lesser extent, maize.

A landlocked nation, the differences in prices across frontiers often encourage a significant amount of unregistered or informal exports. In the period from January to July 1990, Gabre-Madhin (1991, p.177) found that 3,087 tons of cereals were exported to Mauritania via the informal sector while only 101 tons were officially registered as exports to Mauritania.

During the 1950s and 1960s, Mali was a net exporter of foodgrains, but as a result of poor economic and marketing policies coupled with severe droughts and changing consumer preferences, domestic agriculture suffered. After 1965, Mali found itself importing increasing quantities of grain (especially, broken rice) and the recipient of large quantities of food aid.<sup>6</sup>

#### **1.4.2 Communication and Infrastructure**

To get an indication of what kind of dissemination media are most effective for the SIM, this section provides descriptive statistics on the educational level of the population followed by a brief description of infrastructure and communication facilities.

In 1985, the adult literacy rate was 17% for men and 11% for women in Mali (World Bank 1990). During the 1988/89 academic year approximately 5 percent of the population was enrolled in school<sup>7</sup>. Specifically, there were 363,615 elementary and junior high school students, 17,022 high-school students and 1,760 students enrolled in

---

<sup>6</sup> Mali was struck by drought during the 1983/84 and 1984/85 production campaigns, when 130,600 and 202,775 metric tons of food aid, respectively, were imported. Favorable climatic conditions in the succeeding years allowed Mali to recover some of the production loss due to drought; consequently the country only imported 34,000 metric tons of food aid in the 1988 season (DNSI 1991).

<sup>7</sup> This number does not include students enrolled in literacy programs or Koranic schools.

programs equivalent to associate or vocational degrees in the U.S.. During the same academic year, there were 4,569 students divided among 7 institutions of higher learning (DNSI 1991, p.63), that is, about .05 percent of the total population<sup>8</sup>.

The Malian populace is comprised of several ethnic and linguistic groups. Nevertheless, approximately 80% of the population speaks Bambara, while French is the language of instruction. Islam is the dominant religion. Communication facilities are not very extensive and concentrated in Bamako, the capital city. There is a public radio and television network (RTM) with a single channel. Only a small percentage of Malian households own televisions, and most primarily in the capital city and regional capitals. Radio ownership is much higher. Indeed, radio is the main source of information in the rural areas. The national radio station covers the entire country, while some of the regional capitals have their own stations with varying coverage<sup>9</sup>. In 1991, the private sector was permitted access to radio frequencies, and as of early 1992, two private FM radio stations were operating in Bamako. Radio and television programs are done primarily in French and Bambara. There are a few newspapers written in French and Bambara, and telephone service is scant and unreliable even in the capital city. There is a postal service and often transporters (drivers) are asked to deliver correspondence.

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<sup>8</sup> The Rural Polytechnical Institute (IPR), the National School for Administration (ENA) and the Teachers College (ENSUP) are the three most populated colleges with 763, 1168 and 823 students respectively (DNSI 1991, p.63).

<sup>9</sup> It should be noted that ADEMA, the political party that holds a dominant position in the newly elected National Assembly and whose candidate won the presidential election on April 26, 1992, has as part of its platform the abolition of the Ministry of Information and the privatization of the RTM. This could have major implications for how the SIM organizes to diffuse its information. Currently RTM provides this service free of charge to the SIM.

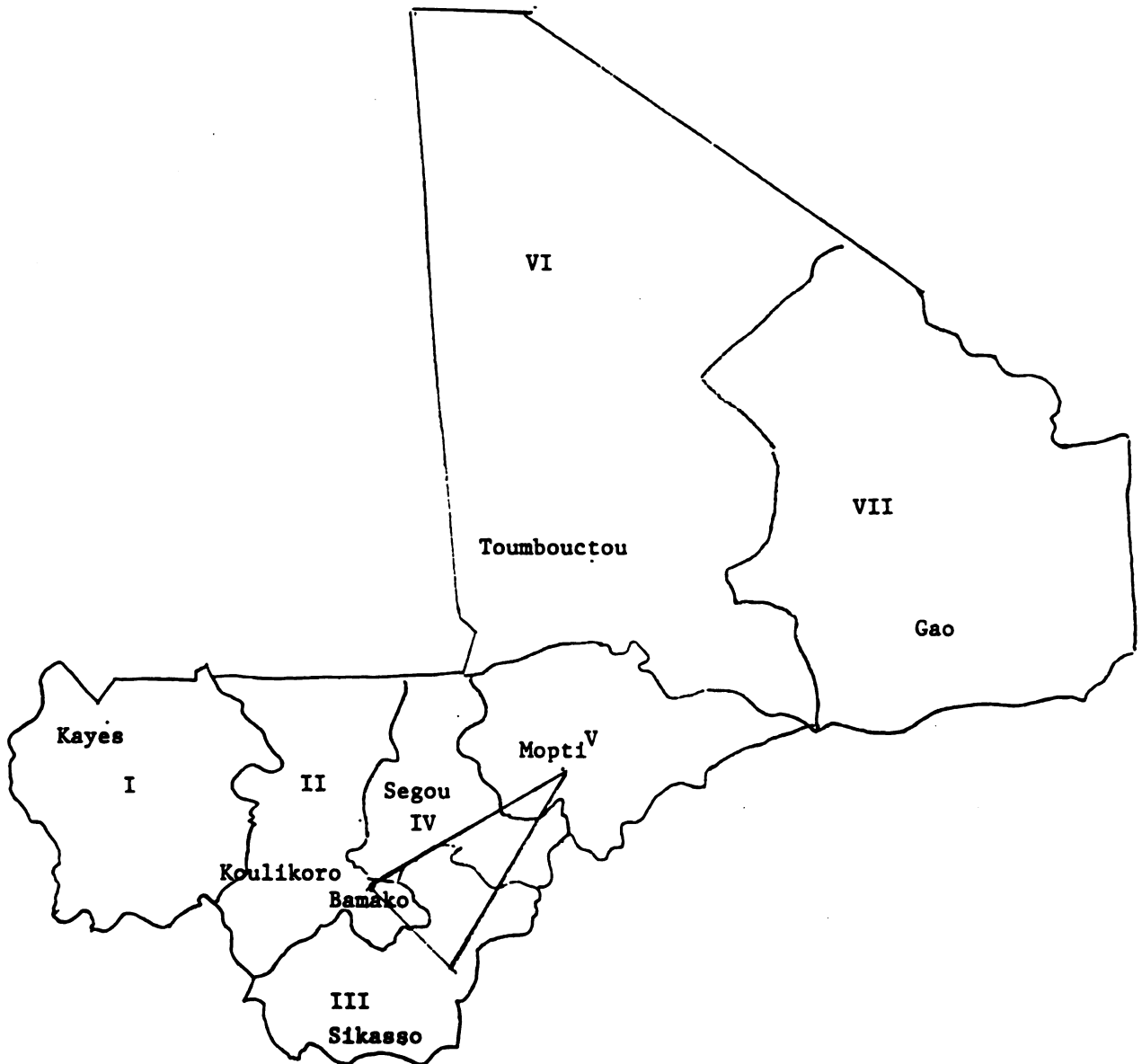
With a road density of only 1.3 km/100 km<sup>2</sup>, the Malian road network is very sparse. Outside of the Bamako-Mopti-Sikasso triangle (see figure 1), most regions are served by poor quality roads or are very isolated. Moreover, most roads are impracticable during the rainy season. The railway system running from Koulikoro to Dakar, Senegal, is very limited and operates at less than 50% capacity. There is also seasonal large boat transport on the Niger River.

What does all this mean for organizing the production of market information? A dispersed population coupled with underdeveloped infrastructure and communication facilities raises the unit costs of gathering and diffusing market information. This has implications for who can produce market information. The low level of literacy and trained people has implications for the users as well as the providers of market information. It implies that providers can't diffuse market information exclusively in written materials and that there is a small pool of potential analysts. Thus, the possible organizational arrangements of analytical products is limited to organizations that possess adequate analytical skills. Low television ownership implies that in order to reach the greatest number of potential users, diffusion of market information must be accomplished via radio.

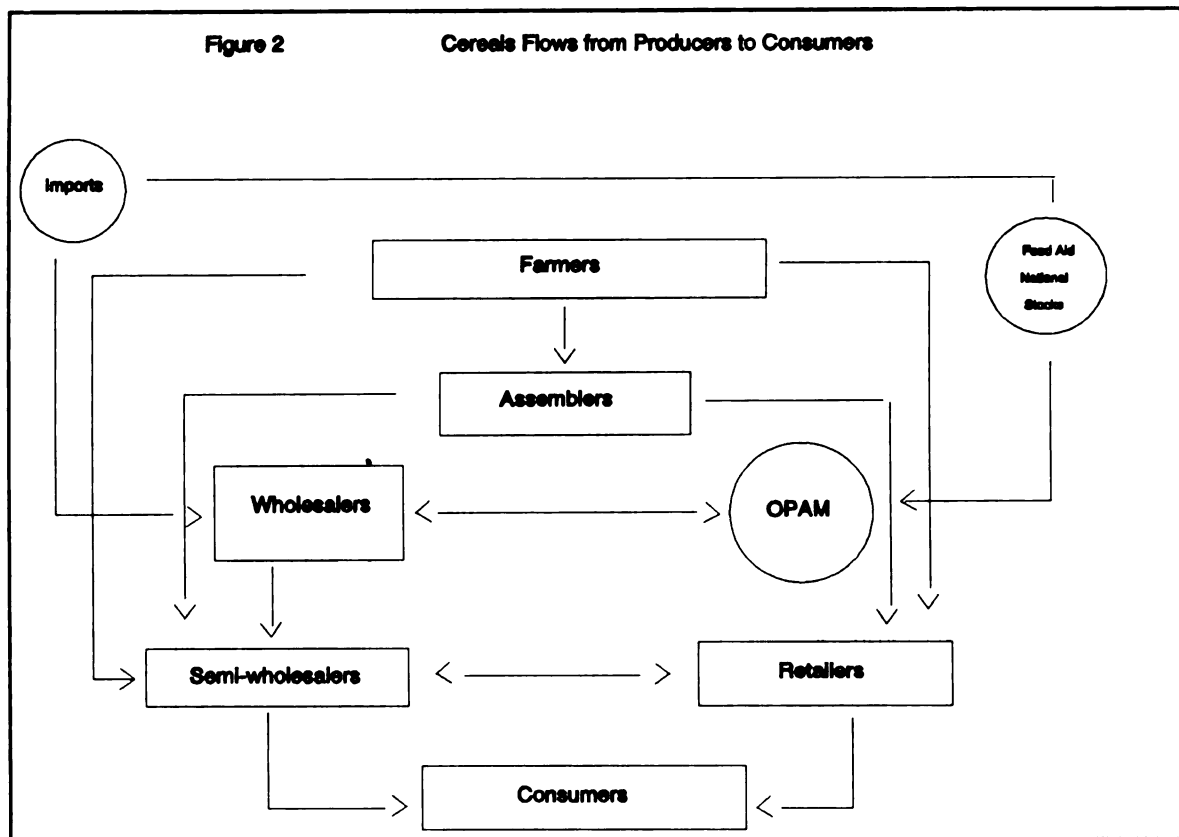
### **1.5 The Cereals Subsector: Structure and Policy Environment**

Understanding market structure is essential to the performance of an MIS. Following market dynamics and the ability to interpret market information are based on an understanding of market structure (see figure 2). Characterized by atomistic and dispersed grain producers and low-grade oligopolistic traders (Mehta 1989), the structure

Figure 1: Map of Mali



I - VII denote administrative regions



of the cereals subsector has evolved with the political and economic regimes.<sup>10</sup> The national grain board, OPAM, until 1986, enjoyed varying degrees of monopoly power (Steffen 1990).<sup>11</sup> Due to a dearth of public goods such as infrastructure, communication facilities, and market-facilitating "good laws" (de Soto 1989), specialization in the cereals subsector is hindered by high transaction costs associated with unstable expectations and several risk factors.

Dioné (1989) identifies several constraints that influence Malian traders' incentives to make long-term investments required for a higher degree of specialization: shortage of working capital; poor access to formal credit; supply and demand uncertainty

<sup>10</sup> See, Staatz, Dioné and Dembélé (1989) for details.

<sup>11</sup> See chapter 2 for a more complete description of OPAM.

and regulatory uncertainty. Some of these uncertainties can be reduced by the timely dissemination of information on supply and demand conditions as well as information on the policy and regulatory environment. And credit reporting services can encourage the development of capital markets.

Prior to liberalization, varying degrees of socialist ideology played a dominant role in shaping and organizing the institutions that governed the grain trade in Mali. Facing a substantial informal foodgrain trading sector and growing financial and management problems of the national grain board, it became obvious that the existing institutions and ideology were unworkable for the populace and unsustainable for the Malian government. Therefore, in 1981, with the aid of the multi-donor and financed Cereals Marketing Restructuring Project (PRMC), institutional reforms were implemented aimed at legalizing private grain trade and reducing the financial and management problems of OPAM.

These reforms emphasized transferring and sharing with the private sector the responsibility and legal right to participate in grain markets and cereals price formation (Dioné 1990). However, it must be recognized that liberalization does not imply or even require complete government withdrawal, as markets cannot exist without a guiding hand to determine (and enforce) the rules and property rights. The process of liberalization in Mali assumed that the private sector had the capacity and willingness to fill the gap left by the withdrawal of the public sector (i.e., OPAM) from cereals marketing (Dioné 1989). Though liberalization stimulated legal entry into the trade (Mehta 1989, found that 43% of semi-wholesalers sampled had entered the trade after liberalization), improved performance in private foodgrain marketing is limited to the extent of complementary and market-facilitating reforms. The traditional trading system was

instituted on trust and kinship; however, as a result of liberalization, new entrants in this expanding subsector made relying on kinship networks alone infeasible. Infrastructure, credit and information services, and ways of facilitating contract enforcement are needed to supplement liberalization efforts.

Thus, confronted with a dynamic economic and more recently political environment, the private sector in Mali is being challenged by new opportunities and uncertainties. Coordination of the private sector can be encouraged by diffusing timely and reliable information. The value of price and marketing information to both public and private decision-makers has increased. Market liberalization increases the number of market participants; therefore, the demand for market transparency increases with liberalization. Designers of MISs must be cognizant of the evolutionary nature of markets and their participants. However, market information systems in developing countries, as well as industrialized countries, often lack mechanisms or innovations (organizational features) that enable them to be flexible and adaptive to the changing environment. It is towards facilitating such flexibility that this paper is written.



**CHAPTER 2**  
**DEVELOPING A FRAMEWORK FOR ANALYZING THE TRADE-OFFS OF**  
**ALTERNATIVE ORGANIZATIONAL ARRANGEMENTS FOR MARKET**  
**INFORMATION SYSTEMS: SOME CONCEPTUAL ISSUES**

**2. Introduction**

A conceptual framework is a tool that simplifies research, analyses and prescriptions by organizing in some meaningful way the pre-existing work of other researchers, analysts and policy-makers. Further, it is the theory that links elements of a system and explains or describes how the system operates. This chapter aims to delineate the pertinent conceptual and theoretical issues that influence the development of an analytical framework for examining the organization of the market information system in Mali. These issues must be carefully considered during the design of the market information system. But first, since more and more economic policies from around the world are placing greater reliance on market mechanisms, this chapter begins with a discussion of the role an MIS can play in stimulating economic growth. The remainder of this chapter examines some conceptual issues that affect the design, provision and dynamics of a market information system.

**2.1 Economic Development and the Role of the MIS**

Examples from around the world indicate that a market-led agricultural development strategy tends to accelerate the transition from predominantly small farmer, subsistence agriculture to a dynamic, market-oriented commercial agriculture (CILSS 1990). One of the key factors facilitating such a transition is farmer access to and understanding of how markets work. North (1987; 1990) asserts that to facilitate the transition from a semi-subsistence (what he calls personal exchange) to a commercial (impersonal exchange) agriculture, specific economic and political institutions are

requisite. The implementation of a market information system is one such effort that can promote expanded transaction opportunities by reducing the agency problems and the transaction costs associated with risk and uncertainty in long-distance and impersonal trade. Market information is essential to reduce the supply and demand uncertainty associated with commercial agriculture in the Sahel. In particular, better information allows farmers and traders to make more informed decisions, potentially facilitating a supply response to emerging market opportunities.

### **2.1.1 The MIS as a Coordinating Mechanism**

Economic coordination can be facilitated by information services. Access to market information (e.g., commodity prices) is a necessary condition for a well-functioning market economy; that is, availability of market information is a key determinant of market performance. In a command or centralized economic system, prices are determined by the central government, and through the State, farmers often have an assured outlet or market for their harvest.<sup>12</sup> However, in a decentralized economy, under the assumptions of perfect competition, prices coordinate activity by directing the allocation of scarce resources. Theoretically these prices are discovered when supply is balanced against demand. Yet, when the assumptions of perfect competition are violated, prices are necessary, but alone, insufficient as coordinating

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<sup>12</sup> Frederich Hayek defines central planning as the directing of the whole economic system according to one unified plan, and a decentralized economy he equates with competition, where competition means decentralized planning by many separate persons (Hayek 1945, p.521).

mechanisms.<sup>13</sup> Furthermore, in a decentralized market-oriented economy, factor and product markets are not guaranteed and hence, not perfectly predictable. Therefore, complementary mechanisms are needed, such as improved access to reliable and timely market information. In his classical article, "The Use of Knowledge in Society", Hayek (1945) argues that *"man's knowledge is unavoidably imperfect, consequently there is a need for a process by which knowledge is constantly communicated and acquired"* (Hayek 1945, p.530). In a decentralized economic system where information (e.g., prices) is needed to coordinate economic activity, the social returns to information exceed the sum of the individual private returns (Riemenschneider 1979, p.21; Bonnen 1977, p.400). The role of information in maintaining competitive markets, increasing equity, increasing access and assisting in planning assure its place as a key policy variable in the agricultural system (Marion 1986, p.97).

### **2.1.2 Level the Playing Field: Some Equity Issues**

Economic coordination and development are highly correlated with the degree of information that all decision-makers (private and public) have about variables relevant to their decision making, i.e., inter alia, prices, quantities, conditions of sale, and qualities offered for market. Market participants with access to information hold competitive advantages over those who lack access to credible and timely information. Hence, an objective of an MIS is to raise the information level of all economic actors. By expanding opportunity sets and facilitating better planning and decision making, the MIS

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<sup>13</sup> Particularly in the thin or residual markets (characterized by low-volume trading and low liquidity) often found in LDCs. Prices generated in such markets may not reflect overall supply and demand conditions, potentially resulting in a distorted price driving the system.

fosters improved overall market performance as well as a broader-based distribution of economic opportunities in society, which in turn affects the long-run growth path of the country (Bates 1989).

However, public provision of market information does not imply equal ability to respond to market information. Dispersed transaction points, underdeveloped infrastructure, lack of storage capacity, and asset specificity are but a few of the impediments to responding to improved information. Language, income level, education and literacy also influence access and ability to analyze and employ improved information. Moreover, information has an impact on market structure in the sense that those actors who are able to respond or adjust to market opportunities, in the short run, are likely to reap greater benefits. Nonetheless, because growth in a risky environment tends to be more concentrated among the rich, improved access to information (and the development of complementary institutions) would empower and encourage smaller operators to invest and expand, thus leading to a broader distribution of the country's wealth.

### **2.1.3 The MIS as Facilitator of Adjudication**

As simple exchange domains move towards more complex and impersonal exchange systems, contract enforcement mechanisms are also necessary to promote development. Analysis of the organization of enforcement mechanisms is beyond the scope of this study. Nonetheless, by lowering the costs of information (through economies of scale), the market information system makes adjudication of disputes less costly and hence enforcement easier. The MIS, in conjunction with effective enforcement mechanisms, permits the foundations of trust and expectations to extend

beyond traditional transacting domains (Bromley 1989). North (1991) identified information about sales representatives to be a major constraint to long-distance trade. This is known as the principal-agent problem, which refers to uncertainty regarding one's own employees. For example, in Mali, the traders (principals) who send apprentices (agents) out with the transporter to engage in transactions for the trader are forced to believe that the transaction took place at the price the agent maintains. In the absence of an MIS, the principal has no way of assuring that the sale did not occur at a higher price and the agent is pocketing the difference. Public dissemination of market prices can reduce this problem by allowing traders to cross-check the prices with the MIS, thus providing traders with greater incentives to expand their scope of operation.

#### **2.1.4 The MIS as Facilitator of Public Planning**

An MIS which collects and processes agricultural statistical data and marketing information can also be employed as a policy instrument to evaluate and monitor the progress and impact of the transition of the market over time, as well as coordinate its evolution in a dynamic agricultural economy. In addition to supporting the development of a commercial, market-led agricultural sector, market information systems assist the public sector in reorganizing and supporting private-sector market opportunities. Also by coordinating and integrating existing data collection services, a reliable data bank of local, historical marketing information can be created. One of the most important functions of an MIS from a public-policy perspective is its ability to monitor the evolution of market structure, so that changes in competitive conditions can be continually assessed.

In summary, uncertainty, defined as the lack of information, forces suboptimal decisions. Risk is considered to be the chance of adverse outcomes. The role of the MIS is to reduce uncertainty, that is, lower the costs of information to facilitate specialization and hence development. Without reliable and credible market information, the substantial risks (e.g., weather) and uncertainties (supply and demand conditions) associated with specialization influence the subsistence farmer's willingness and ability to sell increasing shares of her harvest, thus affecting food security and economic development as a whole. In addition, lowering the cost of information also facilitates the adjudication of disputes, thus making enforcement of contracts easier and less costly. And finally, the MIS provides the public sector with an instrument to monitor competitive conditions.

The preceding section examined some broad macro issues concerning market information systems. The following section looks closely at some of the micro issues, that is, the individual components of the MIS.

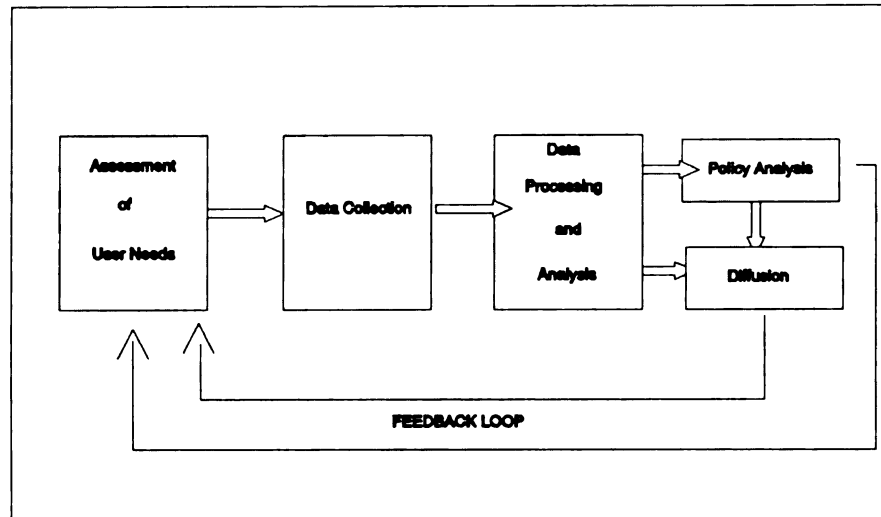
## **2.2 Components of a Market Information System<sup>14</sup>**

It is important to distinguish among data, information and an information system. Data are attempts to capture reality quantitatively or qualitatively. Information is data that have been processed, organized, interpreted and communicated to provide utility in a specific decision or problem context. An information system is a problem-solving tool that collects, processes, analyzes and disseminates information. Specifically, Bonnen (1977) describes information systems as including three inherent function or services: 1)

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<sup>14</sup> This paradigm and section are adapted from Bonnen (1976) and Riemenschneider (1979).

**Figure 3      Market Information Systems Components**



data collection; 2) data analysis and 3) policy analysis. I would add to this paradigm a fourth function, 4) dissemination. See figure 3. Furthermore, each function is comprised of its own discrete operations. The remainder of this section will detail the operations of each functional area and discuss the coordination among these functions as well as issues relevant to each function.

### **2.2.1 Data Collection or Statistical Unit<sup>15</sup>**

The MIS is more than just a data bank; it is a service-oriented organization. MIS data are not specifically collected for the construction of theoretical models, but rather to

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<sup>15</sup> For a discussion of pragmatic data collection procedures see, for instance, Tefft 1990.

help answer specific practical problems. There are three distinct steps that must be taken before data which "purports to represent reality" can be produced: 1) conceptualization, 2) definition of empirical variables to represent concepts and 3) measurement (Bonnen 1977). Data processing follows measurement. These steps comprise the components of the data system.

This study examines how the organization of an MIS affects the reliability of measurement. However, the reliability of measurement depends in part on how accurately the defined variables match the concepts. The relevant measurement issues are best described as a series of questions. What statistical methods are most appropriate? What statistical tests should be applied to the data in order to check for consistency, accuracy and representativeness? Who should undertake data collection at the field level? What incentive structure should be implemented for field enumerators? What is the minimum extent, frequency and type of coverage required to provide the information sought by the different user categories? What is the data processing capacity? This is not meant to be a comprehensive list of questions, yet it does illuminate several key concerns for the MIS designer. Reliable information is the end result of better statistical methods.<sup>16</sup> It is important to note that the aim of this study is the development of a framework to analyze the trade-offs of alternative organizational arrangements for the overall MIS or more explicitly, the information subsector. Although important, it does not focus on micro issues such as appropriate data collection methods or processing systems.

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<sup>16</sup> There is a potential trade-off between the level of detail of data collected and the timeliness of analysis, which affects the usefulness (value) of the information for many MIS clients.



### **2.2.2 Data Analysis Component**

An information system includes not only the production of data but also analysis and interpretation of these data in some purposeful policy-making or decision-making context. Decisions are not usually based on raw data but on some intervening interpretation of the data through, for instance, application of statistical aggregation (e.g., frequency distributions) and economic theory, effectively transforming raw data into a useable form, i.e., information. In general terms, Tefft (1990. p.133) defines analysis as the search for meaning (among observed relationships) in collected data. Interpretation and analysis, however, can range from simply organizing, formatting or encoding data for presentation, to descriptive statistics to complex economic modeling. The analytical technique should depend on the type of data and the objective of the analysis, which is a function of user needs. Nevertheless, analysis must occur within an analytical framework. The underlying dimensions of this framework according to Bonnen (1977) are a) a base of theoretical concepts, b) operationalization of the theory by defining and matching variables to their measured representations (data) and c) testing the framework or model against the data and drawing conclusions. Analysis must be performed in a way that is meaningful and relevant to the user. This influences the initial design and evolution of the MIS.

Additionally, changes in the agricultural sector and/or changes in the agricultural policy agenda demand changes in the system supplying the information. If data analysis or interpretation is to remain meaningful, the "symbolic representations called data" must continuously evolve to reflect adequately the changing environment they were designed to represent (Bonnen 1977). For example, liberalization of the cereals market theoretically induces increased legal participation of the private sector, which could

potentially create a new transaction level or change the market typology. Therefore, data observations should reflect the evolving nature of the subsector.

### **2.2.3 Policy Analysis Component**

Policy analysis as a function of a market information system links the policy-maker or end-user to the data collection and analysis functions, making policy analysis an integral part of the system and vice versa. When designing a market information system, clearly identifying the questions that the system is designed to answer is imperative to ensure the usefulness and thus the sustainability of the system. That is, by giving the user a voice, the MIS can avoid producing and diffusing irrelevant information. A 1991 review of Niger's agricultural data bases concluded that the fundamental discrepancy between what statistical offices are capable of delivering and what policy-makers expect of information services lies at the heart of Africa's data problem. All too often statistical agencies develop information systems reflecting the collectors' perspective without proper attention to the real needs of potential users. This is compounded by policy-makers and other potential users not always knowing what kinds of data they need (USAID and Abt 1991, p.I-3). Thus, the policy analysis function of the MIS is a critical component that determines the effectiveness as well as drives the evolution of the market information system. This function is laden with normative judgements and can put at risk the integrity and objectivity of the entire information system. Therefore, how this component is linked to the other components is critical.

### **2.2.4 Dissemination System**

In theory the design and coordination of this component depends on the needs

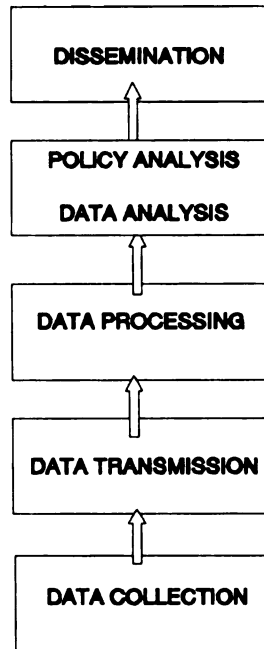
and circumstances of the priority users.<sup>17</sup> However, in reality its design may be heavily influenced by the users with the strongest voice and power. Therefore, a critical question during the design process is whom the market information system should serve. Once this strategic question has been confronted, an appraisal of the proposed users' characteristics (e.g., literacy rate) and circumstances (e.g., dispersed) should be undertaken to help guide the design of the dissemination system. Some key issues: What mode of transmission reaches the greatest number of the intended beneficiaries? Should multiple modes be used? In what language should the information be communicated? When and how frequently should the information be disseminated? Should there be a user fee, and if so, what would be its impact on accessibility of the information to the different categories of users?

### **2.2.5 Coordination among System Components**

A principal concern in the design of a market information system is how the functions or stages of information production should be linked or synchronized. "Problems of coordinating vertical exchange arise wherever two or more parties transact across a technologically separable interface " (Masten 1991, p.3). At each juncture or interface, transactors face a decision of how to govern their relationship (e.g., internally or by contract). Stages or links in the vertical chain for the production of information products include: assessment of user needs (policy analysis function); conceptualization and definition of variables; observation on variables (data collection); data transmission; processing and analysis; and dissemination (see figure 4). From the transaction cost

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<sup>17</sup> National policy dictates who the priority users are. This question is addressed in section 2.5.2.

**FIGURE 4 VERTICAL CHAIN OF INFORMATION PRODUCTION**

perspective, the goal is to promote organizational arrangements (governance structures) that promote efficient adaptations while economizing on the costs of reaching agreements and resolving disputes (Ibid., p.4). This is discussed further in chapter 5.

There are several institutional dimensions to consider. What are the advantages and disadvantages of organizing the market information system horizontally, by function, versus vertically, by commodity group, versus an integrated combination of the two?<sup>18</sup> Given the financial and technical capacities of the MIS, are there synergies to the

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<sup>18</sup> In a horizontally organized system one organization collects data for all commodities, another organization processes the data, and another one analyzes them. Vertical organization refers to having one organization perform all the functions of an MIS (data collection, transmission, analysis and diffusion) for one commodity group such as cereals while another vertical system is in charge of collecting and diffusing market information for vegetables. This concept is expanded on in chapter 5.

integrated approach when dealing with rapidly changing conditions in marketing systems and policy environments? Should the market information system be an autonomous, self-contained unit or should it be integrated with other institutions within or external to government? The trade-offs in timeliness, impartiality and analytical capacity associated with each decision affect the MIS's ability to adapt over time.

Further, the MIS must be a service-oriented institution and not purely an administrative (i.e., regulatory) unit. A feedback mechanism such as a customer service department should be an integral component of any market information system. Additional concerns include how to protect the integrity of the basic data while retaining user needs as the driving force in the system. How do users exogenous to the system articulate their preferences? Trust and credibility are significant factors that influence every facet of the market information system.

In summary, Section 2.2 elaborated the components of the MIS. The following section examines specific factors that influence the organization of the supply and demand for information. Arguments regarding the advantages of the private versus public sector as the institutional base for an agricultural marketing information system are generally well known. However, for the purposes of this study, the principal arguments are summarized.

### **2.3 Factors Affecting the Supply and Demand of Information**

*"The value of information is growing as the markets and institutions of the world become more interdependent under the impact of technological innovations and as the nature of information demanded changes. Information is now an economic resource to be consciously produced, allocated and managed"* (Bonnen 1986, p.1). When used in a

decision-making context, information takes on the characteristics of an economically valuable good. The economics of information analyzes the process by which information as an economic good is supplied and demanded. For this study, supply of information refers to the provision of a market information system and demand refers to the demand for the output of the system - information products. The inherent properties of information as well as structural characteristics of the political and economic environment influence how information will be supplied and demanded. This section reviews the characteristics of information and based on these properties examines the determinants and consequences of why information systems are publicly or privately provided.

### **2.3.1 High Exclusion Costs**

Bonnen (1986) argues that information is an intellectual product and, thus, consumption by one individual does not reduce its supply. That is, information as a commodity exhibits "public good" characteristics. As an economically valuable commodity to be consciously produced, allocated and managed, characterization of information as a public good has implications for how market information will be supplied in an economy. The arguments for and against the public provision of a market information system are generally well known. The essence of the argument is that the private sector cannot recover, due to high exclusion costs (nonappropriability), the substantial costs for establishing the facilities and providing the services required and thus will supply information at socially suboptimal levels. Theory says that without public financing, the social benefit of producing an additional unit of information will exceed the marginal cost of producing it. This is one reason why agricultural MISs around the

world are most often provided by the public sector. However, it is necessary to note that the information supported by the public sector is not always accessible or relevant to the needs of the private sector. Hence, quite often private sector participants operate additional informal or private information systems.<sup>19</sup>

Private or public sector provision also depends on the type of information product demanded. For this study, information products are categorized into three groups: 1) market news such as prices and quantities, 2) credit reports, and 3) analytical products. It is generally believed that the public sector should support fundamental market news services, while more specialized analytical products could effectively be provided by the private sector. Referring to market news, Bonnen (1986) feels very strongly about the willingness and ability of the private sector to provide fundamental agricultural statistics at socially optimal levels. "Efforts such as in the U.S. to privatize all government information are futile and devoid of any understanding of the economics of information" (Ibid., p.i). Additionally, he argues that the information sold by the private sector is purchased for the convenience of format or timeliness of access. He further argues that most of the specialized analysis demanded by a particular decision-maker can be effectively produced by the private sector only because public-sector data bases provide many of the necessary components. In this sense, private firms are only paying for part of the cost of collecting data. Without the public sector, insufficient data or information would be collected or developed, and without the private sector many information services, including the information and analysis required for most specialized

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<sup>19</sup> Prior to the implementation of the SIM, traders in Mali would often send an apprentice along with the transporter. The apprentice's principal function was to monitor cereals flows and prices in the various markets or assembly points. However, information generated among traders is generally inaccessible outside the trading partnership.

problems, would not be available. The increased demand for (highly specialized) problem-solving information is the driving force that brought the private sector information industry into existence in the U.S.. Bonnen concludes that an "appropriate balance between public and private roles is necessary to obtain the full potential of productivity from the information age" (Ibid.).

### **2.3.2 Uncertainty**

The nature of information is such that its value cannot be determined until the information is used, yet to use the information, a cost must be incurred. Bonnen (1986) describes the value of information as the value of the decision made with the information minus the value of the decision made without it minus the cost of the new information (Ibid. p.7). Thus, the a priori returns to investing in information are uncertain. Moreover, the demand for information is derived from its perceived value in reducing uncertainty in the decision making process. Therefore, risk averse users will tend to demand less than the socially optimum amount of information, thus affecting its demand and consequently its production. Willingness to pay for information is a function of the ex ante value and (search cost) of information.

Analogously, the inherently uncertain nature of information affects who will supply it. Due to uncertain demand and nonappropriability of returns, information production is a risky business, and organizations that exhibit scale economies are better able to internalize the risks.

For the provision of market information services, greater assurances of reliability, objectivity and accessibility can often come from the public sector. Although not exempt from disseminating distorted or untimely information, it is generally believed, relative to



the private sector, that the public sector has less to gain by generating misinformation, therefore reducing some of the ex ante uncertainty as well as search costs of information.

### **2.3.3 Timeliness**

Information is "news" when it reduces uncertainty in decisionmaking. To be of value to potential users, "news" must be accessible and available in a timely manner. As a flow commodity (not to be stored), information loses its value with time. For example, last month's market price is not considered "news" for the trader making a purchase decision today. The importance of timeliness varies with the needs of market participants and information products. Policy makers tend to demand both historical and current data. On the one hand, historical data are used to analyze market trends and do forecasting, and thus frequent diffusion is not as critical. On the other hand, decisions to release security stocks require current information. Farmers, traders and consumers require current price and quantity information to make daily sale and purchase decisions.

Accessibility to market information is directly related to timeliness. Market information could very well be produced by several institutions but restricted to certain categories of users. Improved accessibility is central to the public-versus-private debate. It is widely believed that the public sector has a greater incentive to disseminate accessible and relevant market information.

### **2.3.4 Market Structure**

As stated above, possession of information can give economic agents a competitive advantage over those agents who do not possess the same information at the time of the transaction. Agricultural sectors in low-income countries are generally

characterized by dispersed, atomistic sellers and more concentrated buyers. In the absence of public dissemination of market information, merchants, by nature of their trade, will have information advantages over farmers. Similarly, information has an impact on economic structure; that is, there are "informational economies of scale," where a larger scale operation justifies more information acquisition, while more information can lead to a greater scale of operation (Riemenschneider 1979, p.22). It is clear that careful attention must be paid to the potential impact that access to information has on market structure, meaning that information should be provided in such a way as not to reduce competitiveness. Riemenschneider argues that the economic characteristics of information can alter the structure of a sector by creating incentives for vertical integration (greater concentration) simply to reduce uncertainty.

### **2.3.5 Uneven Ability to Use Information**

Equal access to strategic market information for all market participants can influence the conduct of the participants and, therefore, market performance. Demand for information is determined by the users' ability to employ the information in a decision-making context. Analytical capability is bounded by the unequal distribution of resources to respond to market information, asymmetric access to information, educational levels and risk aversion. Market participants who have limited capacity to respond to market information are subject to opportunistic behavior by more capable participants.<sup>20</sup> To increase the social returns to market information systems, and reduce opportunistic conduct, information must be collected, processed, analyzed and

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<sup>20</sup> Capable is defined as the ability, whether legally or illegally, to use information in the pursuit of one's own self interest. This concept is akin to Williamson's "seeking self-interest with guile".

widely disseminated by a reliable and trustworthy source.

Large traders with extensive contacts and better communication facilities have considerable information advantages. Farmers who depend on information from their buyers (traders) are unable to cross-check the veracity of the information. Publicly disseminated information serves to cross-check information stemming from the informal information circuits or networks, thus effectively reducing the differential in the level and quality of information among market participants. Complementary services, such as local agricultural extension offices and credit facilities, could assist farmers in utilizing and interpreting market information. In the U.S. the Cooperative Extension Service has implemented "marketing extension programs" to help farmers and traders use market information to make better business decisions. A similar program could be set in motion in countries like Mali. In short, overlooking users' abilities to take advantage of the market information system can have deleterious effects on the performance of the agricultural sector and the economy as a whole.

## **2.4 Strategic Design Questions**

In addition to the organizational questions, MIS designers must address other key issues that ultimately influence the organization of the production and demand for information products, namely who is the target audience and what commodities should be covered.

### **2.4.1 Who are the Beneficiaries of the MIS?**

In the midst of liberalization in the grain market, policy makers discovered that the private sector had a real demand for reliable, timely and accessible market

information. Suddenly able to trade the fruits of their labor legally, farmers now demanded information on prices in urban centers, traders aspired to know about planned food aid releases, urban consumers wanted to know which urban markets had the most affordable grain prices and policy makers needed a mechanism to monitor liberalization. This paper focuses on four categories of users.

#### **2.4.1.1 MIS Clientele**

Farmers and consumers: In a country where nearly 80% of the total population is employed in agriculture, farmers and consumers tend to be one in the same. Research studies carried out in surplus-producing zones in Mali indicated that 53% of farm households were net sellers during record production years, while 43% were actually net buyers (Staatz et al. 1989, p.712). As consumers, they seek affordable prices and thus need to know current prices in nearby rural markets and large urban centers. As farmers integrating forward into the market, they seek remunerative prices. The producers and consumers in the rural areas have limited access to modern communication facilities and thus rely primarily on radio broadcasts in the local language and informal information networks. The relatively wealthier urban and more literate households have access to newspapers and often television.

Traders: As profit seekers and speculators, middlemen were traditionally thought to be exploiters, and thus their activities were often prohibited. However, empirical evidence suggests that traders do indeed provide valuable marketing services, e.g., assembly, transport and storage. Nonetheless, because they trade with many farmers in several markets, traders possess information about market conditions unavailable to farmers, resulting in asymmetric bargaining power. Unequal bargaining power results

only if there isn't enough competition in the relevant market (such as the case in thin markets) to force traders to offer the competitive price. Underlying liberalization is the hope that the private sector will step in and supply marketing services. However, to perform marketing services traders require information on, *inter alia*, dates and locations of food aid distributions, the availability of credit for rural marketing, etc. Steffen (1990b, p.55) found that a lack of both information about the regulatory environment and transparency in its enforcement influenced the economic behavior of traders and consequently market performance. The socio-economic background of traders is very diverse, ranging from literate to illiterate. Some have access to very modern communication facilities such as telephones, telexes and facsimile machines.

Institutional users: Banks employ current price information to value inventories for the assessment of collateral. Donors, ad hoc projects and research institutions may require statistical data or more in-depth analyses on the dynamics of production, marketing and consumption. This category of users relies more on printed materials.

Governments and policy makers: Often caught in conflict between short and long-term policy objectives, policy-makers require several different types of information. The type of information demanded can be both current and historical, such as statistical data on national grain reserves. Such data must be distributed on a periodic basis in order for policy makers and planners to monitor commodity systems as part of the process of formulating policies.

#### **2.4.2 Which Users and Commodities Receive Priority?**

Most disciplines or schools of thought deliver their conventional wisdom on who and what ought to receive precedence. Some postulate that priority should be assigned

to the largest disadvantaged group, while others hypothesize that a country's comparative advantage lies with export commodities, and as such, producers of these commodities deserve higher priority. Problems arise when the options are mutually exclusive. Target group preference should be aligned with national policy. Dembélé and Steffen (1988) argue that because there is a gap in information between the private and public sector in Mali, initial efforts to implement an MIS should focus on supplying the private sector with relevant and timely market information. The preceding sections elaborated on some of the important theoretical and conceptual issues that influence the design and organization of market information systems. The following section outlines an analytical methodology for evaluating alternative organizational arrangements of market information systems.

## **2.5 Analytical Method for Evaluating Alternative Arrangements**

Is organizational form endogenous? What are the factors that lead some transactions to be integrated while others are left to market mediation? In the information subsector, the manifestations of frictions, i.e., transaction costs, and the factors that influence their incidence vary from agency to agency. The following analysis uses transaction-cost concepts to determine theoretically which organizational arrangements perform well (providing market information services while economizing on transaction costs). The incidence of transaction costs draws attention to the consequences of making mistakes. For example, what is the impact on the performance of the MIS if it were organized like a, b, or c? Since it was not clear how the transaction costs could be measured, in a Malian context, the discussion remains primarily theoretical and qualitative. This section briefly reviews the theory underlying the

method.

### **2.5.1 Transaction Costs Economics: The Underlying Rationale**

By joining aspects of law, economics and organizational theory, transaction costs economics (TCE) aims to deepen insight into the choices among different institutional forms. That is, TCE approaches the study of economic organization and institutions by regarding firms, markets, and mixed modes as alternative means of organization. However, still in its infancy, transaction costs economics suffers from lack of a concrete definition of its basic unit of analysis, a transaction cost. Nonetheless, a great deal of the literature defines transaction costs as information costs, specifically, ex ante or measurement or search costs (costs associated with the physical exchange, such as determining product quality and availability) and ex post costs (costs associated with uncertainty of exchange, i.e., monitoring and enforcement). Transaction costs are influenced by the availability of information. North notes that "the costliness of information is the key to the cost of transacting, which consists of the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements" (North 1990, p.27). Williamson defines a transaction cost as the cost of running the economic system, or the economic equivalent of "friction" in a physical system (Williamson 1985, p.19).

More recent analyses expand the definition to include production-transaction costs (e.g., establishment and dismantlement costs) associated with asset fixity (Johnson 1991), ideology, power, and political institutions (e.g., see Bonnen, 1989). In an effort to develop a framework for analyzing the trade-offs of alternative organizational arrangements, this study attempts to develop and apply an extended version of the

typical Williamsonian analysis.

Essentially Williamson's framework is based on Coase's 1937 article, "The Nature of the Firm". That article argues firms exist to economize on the costs incurred to operate in the market (i.e., transaction costs). Furthermore, Williamson argues that it is the attributes (e.g., asset specificity and uncertainty) of the transaction, in concert with human factors such as bounded rationality and opportunism, which give rise to transaction costs. To mediate these costs, transactions are discriminately assigned to specific organizational (governance) structures. "...transaction costs are economized by assigning transactions (which differ in their attributes) to governance structures (the adaptive capacities and associated costs of which differ) in a discriminating way" (Williamson 1985, p.18).

Asset specificity refers to durable investments that have their highest value in the transaction they were deployed for and whose value would be lower in the next best alternative use. Williamson defines opportunism as self-interest seeking with guile, such as incomplete or distorted disclosure of information. This concept is particularly useful when examining the public versus private sector debate over who should produce and disseminate market information. Moreover, opportunism complicates problems of economic coordination by compounding the sources of uncertainty. In summary, the goal of transaction costs analysis is to organize transactions such as data collection, transmission, processing and diffusion in a way that economizes on bounded rationality while safeguarding the users against the hazards of opportunism (Williamson 1985).



### **2.5.2 Transaction Costs in the Context of the Information Subsector**

In an effort to identify the transaction costs in the context of organizing for the production of information products, it is important to distinguish between transaction costs in a strategic, opportunistic sense and external costs, which are real limitations. For example, deliberately misreporting or making up data to meet reporting deadlines, or enumerators who fail to collect data in their assigned markets, or the conscious delay of dissemination of market information are examples of true transaction costs that the users incur. Exogenous disturbances such as equipment breakdown can be considered real limitations. For instance, in Mali, the RAC (radio system) is used to transmit field data to the central processing unit in Bamako. If the RAC for some reason is inoperable, this delays the processing and dissemination of information and thus the external costs incurred by the provider increases.

The analysis of transactions requires recognizing the main behavioral attributes, such as rationality (which could be related to training and motivation) of economic agents or institutions. It further requires identifying the basic attributes with respect to which transactions differ. For example, when comparing Malian organizations that perform data collection services, such as the National Directorate of Statistics and Information and CNAUR, the Malian agency concerned with emergency aid and rehabilitation activities, how does the difference in collection method influence reliability of the final product? Or how do the different incentive structures for field enumerators of various organizations influence the final product? Is there an increase in (transaction) costs associated with poor incentive structures for enumerators?

Theoretically, greater asset specificity leads to higher degrees of internal organization, i.e., vertical integration. Analysis of the feasible alternative arrangements

for a market information system may indicate that a completely vertically integrated (from field enumerators, to transmission mechanisms, to analytical skills, to in-house dissemination medium, i.e., owned radio frequency) system may be the most efficient way to economize on transactions. The analysis could begin by addressing the following: What is the idea transaction or situation? What are the transaction costs involved in a particular organizational form? This chapter discussed some conceptual and theoretical issues that influence the organization of MISs, constituting the beginnings of an analytical framework. The following chapter examines some empirical issues.

# **CHAPTER 3**

## **MIS DESIGN GUIDELINES BASED ON EMPIRICAL EVIDENCE FROM MISs AROUND THE WORLD**

### **3. Introduction**

In addition to the economic characteristics of information, there are empirical concerns that influence how MISs are organized. Since this analysis of the trade-offs of alternative arrangements is predicated on transaction cost theory, before comparing the magnitude of the transaction costs, a reference for comparison is needed. For this study, the magnitude of transaction costs is measured qualitatively, drawing on empirical evidence from other country experiences with market information systems. By examining MISs from around the world, this chapter identifies key factors that influence how MISs are organized and ultimately how they perform.

#### **3.1 MIS Objectives From Around the World<sup>21</sup>**

An assessment of the trade-offs of alternative organizational arrangements cannot be undertaken until the objectives of the market information system have been established. Once the objectives are determined it is then necessary to discern what characteristics are requisite to allow the system to realize its objectives. Therefore, before considering some of the design issues, this section examines a broad cross-section of objectives of market information systems throughout the world.

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<sup>21</sup> The aim of this chapter is to examine a broad cross-section of MISs throughout the world with the intent of portraying some of the recurrent issues that either facilitated or constrained the success of the systems. However, information sources are fragmented, and at best overly generalized. Most of the illustrations in this chapter are drawn from three major sources: 1) Schubert/FAO (1983), which examined a broad cross-section of MISs in Africa, Latin America and Asia; 2) Eele (1987), which examined statistical services in Africa and 3) Bonnen (1977, 1986), which examined the U.S. agricultural statistical system. The remainder of the illustrations are from miscellaneous consulting and project reports listed in the bibliography.

In the U.S. agricultural information system, the National Agricultural Statistical Service's (NASS) goal is to diffuse information such that the "Virginia farmer has access to the same information as the large grain merchant in Chicago" (NASS 1987, p.1). In addition to gathering a large and important segment of the nation's agricultural statistics, the information generated and diffused by NASS aims to keep farmers apprised of market conditions, to help keep stable and efficient agricultural markets, and to assist in maintaining a "level playing field." That is, the aim is to assure that information is widely available without favoritism or special privilege (Ibid.).

In Canada, policy makers aim to "assure consumers, at all times, of high quality food at reasonable prices and to assure farmers a decent living" (Statistics Canada 1980, p.3). Thus, the objective of (Agricultural) Statistics Canada is to provide information that support policy and program decisions in the agricultural and food sector. In the socialist planned economy of China (PRC), the statistical reporting system provides a critical stream of information which the PRC production leaders use to make economic decisions and allocate resources. Mandated objectives of China's statistical system include collecting, summarizing and analyzing statistical data on China's economy; and providing data to government, party leaders and managers of enterprises (Tuan 1983, p.41).

In Indonesia, the MIS was implemented because the government believed that market innovations could only be realized after thoroughly understanding existing market conditions. The market information service for fruits and vegetables in Brazil sought to "ensure that producers possessed an actual market situation know-how, enabling them to negotiate on an equal information basis with traders" (Schubert 1983, p.44). In Tanzania, the Market Development Bureau operated a centralized public market

information system for unscheduled crops aimed at "informing both producers and consumers about supply and demand conditions in major producing and consuming centers" (Schubert 1983, p.68).<sup>22</sup>

Believing that small rural producers lacked information on current market prices, the MIS in Senegal endeavored to circulate grain market information that would not only aid in the establishment of a clear, harmonized national market, but also enable economic actors to make informed purchasing, transfer and sales decisions based on knowledge of available opportunities (CILSS 1990, p.91). In the Philippines, the MIS aims to improve decision making at all levels in the marketing chain and eliminate instances of monopoly power by enhancing the competitive environment. The system also aims to make economic actors aware of investment opportunities, increase the bargaining power of producers, reduce price fluctuations and increase market transparency (Menegay et al. 1990, p.1).

In short, MISs throughout the world have multi-faceted goals and have recognized that statistical information plays an important role in the planning process, whether targeted for either the private or public sector or both. Most MISs, however, emphasize "leveling the playing field" between traders, farmers, and consumers. The following sections explore some of the factors that facilitate or constrain the capacity of the market information system to meet its explicit objectives.

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<sup>22</sup> Unscheduled crops refer to crops that are not marketed through the State marketing board.

### **3.2 Factors Facilitating the Success of an MIS**

Market information systems aim to enhance public and/or private economic performance. From a public-policy perspective the success of the MIS is measured in terms of the MIS's contribution to the overall economy. The success of a market information system is determined by how well the system satisfies its objectives, as well as its ability to induce demand for its output. Further, an MIS is considered successful when the system continues to function and is able to evolve further on a self-sustained basis once external donor support is terminated.

#### **3.2.1 Performance Criteria**

From the broad cross-section of MISs examined in this study, certain critical parameters emerged as being key elements that facilitated the success of the system. These include the system's capacity to generate reliable, credible and objective information as well as its ability to diffuse timely and accessible information. Indeed, reference has already been made to these parameters since the production of information products cannot be discussed without implicating them. This section formalizes the arguments.

Reliability refers to data quality where quality is measured by the amount of error in the data as well as their overall utility or relevance to the uses for which the data are intended (President's Report 1981, p.160-1). Credibility refers to the unbiased objectivity of the statistical or analytical product as perceived by users of the information. Perceptions of the users are critical - an MIS can be unbiased but perceived to be biased. Accessibility refers to equal access (including simple and understandable presentation) for all targeted users. Referring to the continuous and consistent diffusion of

information, timeliness is a critical property. Information that is diffused late is no longer "news"; that is, users are unable to gain any value from such information in their decision-making processes.

The above discussion is by no means all-inclusive; however, empirical evidence suggests that the preceding properties are among the most salient. Thus, any organizational arrangement that compromises any of the above increases the transaction costs borne by the users of the information. In addition to these key attributes, there exist critical features of an MIS that facilitate its development (ability to satisfy the above criteria) and sustainability. The remainder of this chapter identifies and discusses these features.

### **3.2.2 Training, Management and Incentives**

In order for an MIS to generate and disseminate reliable, credible and timely information, much of the literature surveyed emphasized the importance of adequately trained and motivated enumerators and a well-managed data collection system. Proper data collection is as critical to the success of the market information system as an engine is to the operation of a car. Low quality data can be attributed, inter alia, to lack of training and supervision of enumerators, including lack of accuracy or consistency in sampling methods.

**Training.** This section discusses two critical training dimensions. The first concerns training in data collection techniques and the second includes training in market dynamics, which fosters an understanding of the purpose of market information. For the data collection component of the MIS more attention needs to be paid to the

use of simple techniques, non-random samples and qualitative reporting systems.<sup>23</sup> In addition to simple statistical techniques, training in data entry, processing and analysis is also important. Training in agricultural marketing terminology such as transaction levels in the marketing chain (e.g., farm gate, assembly, wholesale, retail) and the distinction between producer and consumer prices should be included in enumerator training programs.

It is not only training in feasible and effective data collection techniques that is critical, but also the skill to undertake analysis. Through its studies, USAID & Abt (1991, p.23) established that in Africa "the capacity to collect data significantly exceeds the ability to organize and analyze it". In LDCs, there is frequently a paucity of analytical skill. However, in some cases, expatriate or local personnel possess analytical skill, but due to the pervasiveness of data quality problems (often the result of poor enumerator training) and frequent shortages in staff, analysts spend much of their valuable time checking data quality or overseeing administrative concerns<sup>24</sup>.

**Management.** Eele (1987, p.6) argues that in LDCs, it is often more important for statisticians to be managers with an understanding of the sector being studied than to have advanced training in, e.g., probability theory. He further maintains that a statistician responsible for the collection of agricultural data is 80 percent a manager, 15

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<sup>23</sup> Relative to random sampling, non-random sampling has the advantage of providing quick insights and can economize on time and resources. However, one must use non-random sampling methods cautiously, as it is often dangerous to generalize from non-random samples. A critical design issue is determining the types of questions that can be adequately addressed through purposive sampling versus those questions for which a random sample is absolutely necessary.

<sup>24</sup> Many of the data processing systems in LDCs are not automated. Due to the scarce analytic resources, there is a high payoff to automating routine data checking and report generation.



percent an agriculturalist and 5 percent a mathematician (Ibid.). FAO/Schubert (1983) maintains that MIS management should include a team of professionals trained in agricultural marketing and economics, statistical methodology, and administration and organization. Indeed, upgrading staff skills should be an integral component of the initial stages of the MIS. In India, the MIS planners believed that experience with and understanding of wholesale trade for enumerators and managers was critical, and that training in statistics was a bonus. The success of the decentralized information system in Brazil is largely due to management and personnel experienced in marketing operations and trade issues.

**Incentives.** According to FAO/Schubert(1983), most market information systems in developing countries suffer from an inability to motivate and adequately supervise data collectors, which eventually leads to low-quality information. The World Bank (1990) found that over the years few initiatives were launched to meet the changing demands and/or incentive structures of statistical employees. In the absence of adequate logistical support, many enumerators in many developing countries often fail to visit some of the markets they are assigned to observe. Moreover, as market prices vary over the course of the day, in some data collection systems, enumerators are supposed to arrive at the start of the market day and remain until it closes. What is their incentive to do so?

Furthermore, in the literature, problems of transportation, poor infrastructure, low salaries, and lack of insight or feeling of purpose were commonly cited as reasons for less than full dedication to data collection activities. In Tanzania, data transmission was achieved via the unreliable national postal system. This unreliability in conjunction with a shortage of postage stamps often delayed data transmission, adversely affecting the

timeliness of the information. A 1991 study of the Niger MIS revealed that the field enumerators were the lowest paid and least trained of the MIS personnel. Lack of career opportunities for MIS personnel and a missing system of oversight and motivation, coupled with the ease of making up data, were additional reasons cited for poor performance of enumerators. To deal with the incentive problem, the "New" Livestock MIS in Niger provided enumerators with motorcycles and reduced the number of markets that each enumerator covered. The new livestock MIS reports on only 42 markets compared to the 600 markets followed under the old system (USAID & Abt 1991, p.19).

In summary, in-service training for data collectors that focuses on understanding the purpose of market information and leaving enumerators with a better command of feasible and effective data collecting techniques is essential to the success of the MIS. Enumerators must understand their role in the broader context of the system goals. Moreover, to control the data quality, data controllers are needed to check regularly and systematically the way in which data collectors work. The supervision and support of enumerators must be permanent task of management, and it is just as important to train managers in administration and organization as well as statistics and economic analysis.

### **3.2.3 Systematic Implementation**

Market information systems that have been successfully implemented usually begin as pilot projects that cover a limited number of commodities and markets, and gradually expand coverage both horizontally and vertically.<sup>25</sup> Systematic

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<sup>25</sup> Horizontal expansion refers to additional regions and commodities, where vertical expansion refers to the production of additional information products, such as credit or outlook reports.

implementation allows the designers to, in effect, "de-bug" the system prior to implementation and operation of the permanent system. MIS designers should first undertake an investigation of the existing supply and demand for market information and in conjunction with the overall goals of the system, form the basis of the MIS. The FAO advocates an iterative process where goals are first defined, current conditions are then assessed, including the institutional framework and training needs, and finally plans are made and implemented. Evaluation is the final phase in the process.

MIS designers in Chad followed a systematic approach by drawing on lessons learned from other country experiences. For example, initial undertaking of user-need surveys and inventories of existing data collection efforts were activities undertaken in other countries in the region. Similarly, the Malian SIM began as a pilot project that served as a forum for reflection and training for the establishment of a permanent SIM. This method was very effective in helping to illuminate and iron out initial problems. The Tanzanian experience is an example of an organization that took on too much too fast. The Market Development Bureau (MDB) in Tanzania implemented an MIS that sought to provide information about supply and demand conditions in major producing zones throughout the entire country. The MDB never assessed user needs or available resources. Nor did it carefully analyze the marketing system or properly plan the implementation of the MIS. Enumerators and supervisors (who were regional leaders) were inadequately trained in data collection techniques and did not fully understand the marketing system. The resultant information product was unreliable and the monthly market information bulletin was consistently one to three months late (Schubert 1983, p.67-69).

In terms of what variables to monitor initially, the FAO studies ascertain that

price and production information are fundamental and are easily understood by national government official at the early stages of the economic transformation process. Indeed, in many LDCs, market information systems are primarily price reporting services. However, as the level of development (e.g., economic and educational) and market integration increases, the MIS should venture beyond merely reporting price information and eventually incorporate market analysis and prognosis.<sup>26</sup> This suggests that market information systems evolve gradually with the stage of development. It should also be noted that an effective market information system can also contribute to advancing the stage of development.

#### **3.2.4 Data Relevancy and the Feedback Mechanism**

Eele (1987) contends that many statistical services (as a component of the information system) in the developing world have failed to collect information relevant to the daily decision-making needs of the private sector. He maintains that African statistical agencies suffer from "statisticians blight", the propensity of statistical organizations to get caught up collecting, in a statistically rigorous framework, data for data's sake. Eele argues that if MISs are to become more useful, the distance between users and providers of information products must be reduced. As discussed in chapter two, the policy analysis function links the user to the provider.

However, many MIS designers advocate the separation of the policy analysis component from the data collection and analysis components, maintaining that such separation protects the objectivity of the basic data. For example, manipulation of data

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<sup>26</sup> It should be recognized that one objective of a market information system is to reduce market uncertainty, thereby inducing farmers to produce more for the market.

were observed in a pilot MIS project in Thailand. The system operators justified manipulation by saying that the publication of falling prices (revealed by their data collection activities) would only have encouraged traders to pay farmers less. Yet, the goal of the system was to put farmers on equal footing with the traders. However, others encourage strong linkages between the components.

The failure of statistical initiatives is not solely due to the statistical units' inability to adapt to changing conditions, but also to actions and misconceptions of data collectors and users. Information systems have been developed from the collectors' perspective without proper attention to the needs of the potential users, often resulting in irrelevant information. To design a market information system that remains accurate, reliable and relevant in the future, an organizational innovation capable of perceiving changes in the environment is requisite. Bonnen argues that a fundamental problem in the design of an agricultural information system is the system's inability to remain abreast of changes in the policy agenda and the agricultural sector, resulting in a significant reduction in the system's capacity to provide relevant information (Bonnen 1977, p.399). Towards this end the capacity for redesign must be a normal internal function of the system.

A feedback mechanism can facilitate this capacity. For a successful MIS, it is essential to facilitate open dialogue between the users and providers of market information. Frequent consultation with farmers and traders and the MIS staff played a critical role in balancing the supply and demand of information in Indonesia. In fact, the field enumerators took the initiative to undertake an attitude survey of the users and discovered that a lack of appreciation of the potential benefits surfaced, underscoring the need for a user education program.

### **3.2.5 User Education**

As indicated above, the ability to collect data in most developing countries far exceeds the ability to analyze and constructively employ the information. In order to induce demand, many of the successful MISs emphasized the necessity of a user education component or even a publicity campaign. For example, in Senegal, many of the potential users did not understand the reported prices and several of the market operators interpreted the diffused prices to be official prices rather than reported market prices. Furthermore, diffused over the radio, many listeners were confused over the type of prices broadcasted (producer versus consumer prices). Moreover, most people were unaware of the existence of the MIS and had no conception as to what a market information system was or how they could benefit from the timely and reliable dissemination of market information.

In developing countries, it cannot be assumed that all policy-makers and planners are trained to think analytically. To use the MIS effectively as a problem-solving tool, users need to know what kind of statistics or analyses are necessary to answer specific questions, as well as what questions to ask. Data collection systems need to demonstrate better how their information can be used. To facilitate comprehension and hence induce demand for information products, the MIS must be service oriented and provide continuous, uninterrupted service that is easily comprehended by the average user.

### **3.3 Factors Constraining the Success of MISs**

Section 3.2 examined several factors that could facilitate the successful implementation and operation of an MIS, namely, a well trained staff and a well managed data collection system, relevant data and a feedback and user education system.

Systematically implementing the MIS also proved to be a critical factor. The absence of these factors may constrain the success of the market information system. Furthermore, empirical evidence suggests that in addition to these factors several MISs have suffered from a lack of demand for their information products, leading to a lack of administrative and budgetary support. The next section examines these issues.

### **3.3.1 Failure of Demand**

Is the product from the information system actually wanted? Has the value of information in the decision making process been adequately portrayed? Are statisticians answering the right questions? Eele (1987) queries whether the problems associated with agricultural statistics in Africa are a failure of supply or demand. Lipton (1986, cited in Eele, 1987, p.3) states that "there is no genuine government demand (in Africa) for agricultural statistics which is why they are not supplied". Eele argues that MIS designers must first focus on why statistical information is not demanded before examining how to increase or improve its supply.

Most of the statistical systems in developing countries exist, and are sustained by external financing, not local demand. As a result, these systems are supply-driven. For example, in Niger, there appears to be a lack of demand for systematic policy analysis by decision-makers and thus a lack of demand for statistical and analytical products (USAID/Abt 1991).<sup>27</sup> It appears that policy makers in Niger have little confidence in the statistical system's ability to produce relevant and timely information products. Thus, in Niger there appears to be a need to stimulate demand for policy analysis while

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<sup>27</sup> Policy-makers often bypass the statistical system and rely on their own informal information networks.

simultaneously enhancing the capacity of local institutions to meet those demands.<sup>28</sup>

The Peruvian MIS also suffered from a failure of demand. However, in this case, the private sector felt the informal information network sufficiently met their needs (Rinaldi 1985). The MIS in Burkina Faso was designed and implemented by external sources that essentially failed to evaluate user (either public or private) needs (CILSS 1990).

Above, a successful MIS was defined as one that not only satisfies its explicit objectives, but also is capable of inducing demand for its product. This underscores the need for a feedback mechanism between policy analysts and data providers. Such a mechanism is an alternative to having the policy analysis, data collection and analysis components within one organization, reducing the risk of threatening the objectivity of the basic data.

### **3.3.2 Information Overload**

Related to concerns of data relevancy and subsequent failure of demand is the enigma of information overload. Hayek (1945), referring to an economic actor, asserts that "it is always a question of the relative importance of the particular things with which he is concerned, and the causes which alter their relative importance are of no interest to him beyond the effect of those concrete things in his own environment" (Ibid., p.525). Too often, statistical services and market information systems diffuse information that is either irrelevant to the decision-making processes of users, or is jumbled with information beyond the scope of their decision making needs. In fact, investigation of the Peruvian MIS revealed that users not only misinterpreted the statistical output, but

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<sup>28</sup> See, for instance, Weber et al. 1988.



also complained that too many products and areas unrelated to local conditions were covered (Rinaldi 1985), making it very difficult to comprehend and hence use the output of the MIS.

The MIS must diffuse relevant information frequently enough to be useful, but avoid overloading the user. The rate of dissemination should be a function of the operational need to inform strategic decisions for market participants and policy-makers. Focusing data collection initiatives on fewer variables and targeting different outputs to different users can lower data collection costs and allow for greater control over collection and diffusion activities, which can influence the quality of the final product; data collection becomes user-oriented.

### **3.3.3 Institutional Apathy and the Missing Budget**

Budget and administrative support are requisite to assure the sustainability of the information system. This is directly related to the above issues of demand and data relevancy. If indigenous demand has not been created, then there is little incentive for national governments to support or budget scarce resources for the MIS. This is evidenced by the several MISs throughout the developing world that have collapsed once external support and funding were withdrawn. MISs often face a vicious cycle: in the absence of demand, the local administration finds little need to appropriate already scarce resources for the development and sustainability of information systems. At the same time, without adequate resources, the MIS is unable to invest in producing reliable and relevant information products that could induce demand.

Changing political environments can also hinder the success of the MIS. For example, China's prime agricultural statistics agency was established in 1952, and later

disbanded during the infamous cultural revolution and re-established again in 1981. The changing of the guard can prove deleterious to statistical agencies. One regime may understand and promote the value of objective and timely information, whereas another may pursue policy objectives that it believes warrant controlling and perhaps manipulating the data. Empirical evidence also attests that during budget crises, statistical departments are among the first to feel the crunch. This is particularly true where MIS providers have not yet convinced users of the benefits of using MIS information products in decision making. Because it is difficult to measure the returns to MIS activities, funding cuts remain a constant threat. However, if national demand for the MIS product is forthcoming, then national willingness to pay for, or at least place a higher priority on sustaining and improving the market information system, increases. Observation also suggests that the MIS needs administrative and financial autonomy. Nonetheless, without a sustainable commitment of budgetary (from both national and donor sources) and institutional support the success of the MIS will be restrained.

To further illustrate, Bonnen (1977) argues that many of the problems of the U.S. Census of Agriculture arose out of inadequate resources and a long-term lack of administrative support. He maintains that the top political leadership of the US Department of Commerce in the 1970s often viewed the Census of Agriculture as a service activity which was "marginal to the mission" of the department and thus, a natural candidate for budget and administrative neglect (Bonnen 1977, p.391).

### **3.3.4 Insufficient Coordination**

"It is the conscious design of the MIS as a system which must be fully respected if the data are to be accurate, and if the information upon which decisions are based is to

be reliable" (or even available) (Ibid., p.398). Insufficient coordination of the MIS components has an impact on the timeliness and reliability of the information product, which can directly affect the goal of the system, or more specifically, the intended beneficiaries. In most LDCs, the technical and managerial skills needed to foster a well-functioning MIS are unlikely to be available in a single institution; hence, proper coordination amongst the various agencies becomes critical. In fact, conscientious coordination (including coordination among donor programs) is the driving force behind the success of the system.

To promote a more efficient and effective market information system, MIS providers must avoid working in isolation. For example, in Jordan, the MIS suffers from a lack of coordination between government bodies, which results in fragmented and overlapping responsibilities. This could be disastrous for nations with scant resource bases. Evidence from the developed world suggests that the impact of progressively greater specialization of function and organization can subsequently lead to organizational fragmentation of the information system components. Bonnen (1977) argues that as specialization fragments the organization of information systems, it becomes more difficult to maintain a coherent, integrated system, which directly influences the information system's capacity for problem solving, i.e., producing relevant information.

### **3.4 Summary and Conclusions**

The above issues of training, management, data relevancy, systematic implementation, information overload, user education, coordination, and institutional support can serve as useful guidelines for MIS designers in developing reliable, accessible, objective and

timely information products. These factors influence the organization and performance of a market information system. It is important to note that a single institution may be unable to meet the guidelines, such as providing a user education program. Our task is to discern which organizational arrangement best satisfies the above guidelines while economizing on transaction costs. The following chapter identifies the major players in the Malian information subsector.

## **CHAPTER 4**

### **THE MALIAN AGRICULTURAL INFORMATION SUBSECTOR**

#### **4. Introduction**

Traditionally agricultural market information systems in Africa were oriented to a very narrow group of users, namely the public sector. Today, however, MISs face a broader clientele, including private market participants who need not only reliable but timely information. Thus, MISs are redirecting data collection and dissemination efforts to meet the needs of a broader clientele base. Towards this end, information systems are being re-organized.

To promote an understanding of the organizational alternatives available in Mali, this chapter will examine the SIM within a subsector framework. A subsector is defined as the interdependent array of organizations, resources, laws and institutions involved in the producing, processing and distribution of a commodity. Subsector analysis focuses on the vertical system from input procurement to marketing output. It draws attention to the vertical value-adding process leading to the final output, the control of the critical parts of the subsector, as well as on the coordination needed to synchronize and integrate the contribution of each stage (Marion 1986, p.52). In this context, the information subsector is comprised of several stages, including data collection and transmission, data processing and analysis and diffusion of information. See figure 4 in chapter 2.

This chapter further identifies and describes, in terms of organizational mandate and scope of activities, the major local institutions involved in the collection, analysis and dissemination of grain market information in the Malian information subsector. Each has distinct roles and contributions and varying capabilities for carrying out its mandate. It is critical to understand each institution's strengths and weaknesses in order to identify

potential trade-offs associated with each organization and assess the various institutions' abilities to adapt to changes intended to improve the subsector output as a whole.

#### **4.1 Food Security and Agricultural Market Information in Mali**

Food security and subsequently food policy strategies remain an important issue for many developing nations. Data banks and the resulting information are needed to monitor food security situations as well as evaluate the impact of various policies designed to improved food security. In his paper, "Panorama of Information Systems", presented at the 1990 CILSS Seminar on MISs, Alan LaLau-Keraly advances what he terms the "network of information production on food security" as a framework for analyzing food security information. In the Sahelian context, he asserts that all information relevant to the availability, distribution and accessibility of foodgrains and livestock are important for monitoring and ensuring food security.<sup>29</sup> This is a useful framework for analyzing the Malian agricultural information subsector.

There are several organizations and agencies that deal with various aspects of agricultural market information in Mali. Collectively they comprise what can be called the "information subsector". The concept of an agricultural information subsector is very broad in that a whole gamut of commodities, regulations, weather forecasts, inputs, etc., can be included in the information handled by this subsector. Similarly, the concept is broad in that it includes both public and private providers of market information. However, since foodgrains account for 84% of Malian dietary calories (CILSS 1991), they heavily influence the food security of the population. Therefore, market

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<sup>29</sup> It should be noted that while foodcrops are important, the production of other products such as livestock affect income and thus heavily influence the food security of some groups (particularly in the north).

information for this study concentrates on information and institutions involved directly or indirectly in the cereals subsector. The following sections describe briefly the statistical agencies, analytic groups and dissemination services involved in collecting, analyzing or diffusing information concerning the availability, distribution and accessibility of foodgrains.

#### **4.2 Statistical Agencies**

In Mali, there are several organizations that collect data concerning the availability, distribution and accessibility of foodcrops. Availability pertains to the cereals balance, that is, spatially balancing aggregate supply with aggregate consumption requirements. Aggregate supply includes information on national grain stocks, cereal imports and exports, domestic production and food aid, while aggregate consumption requirements include information on population growth rates and household consumption estimates.

A fluid distribution or exchange system is critical in matching food surpluses and deficits across time and space. In theory, under liberalization, this matching of supply and demand is coordinated via market prices. Dissemination of decentralized grain prices and information on local market conditions is one way of facilitating distribution across time and space.

Accessibility in this framework refers to the "early warning system", that is, the early detection of domestic supply risks as suggested by poor rainfall or disease and pest infestations indicators. Information on health, nutritional status, rainfall and food aid distributions are some of the statistics collected, analyzed, and diffused by institutions involved in monitoring "at risk" populations.

From the above it becomes obvious that food security related information on the cereals subsector is vast, emphasizing that the information required to inform food security strategists is very broad. Therefore, depending on the objective of the collecting organization, all or pieces of the information concerning food security may be collected or centralized in one institution. For each of the statistical agencies, the following sections describe their location in the Malian administrative structure, their scope of activities and the primary users of their statistical products. Since one of the objectives of this study is to assess the current institutional capacity to provide market information products, defined here as the reliable and timely diffusion of market news (e.g., prices) and analytical products (e.g., situation or outlook reports), the following sections will also identify possible trade-offs of having the indicated institution provide data collection activities compared to the current SIM providing the same services.

#### **4.2.1 The National Directorate of Statistics and Information (DNSI)<sup>30</sup>**

*Location and scope of activities.* DNSI, located within the Ministry of Plan, is responsible for macro-economic and census statistics. In order to develop cost-of-living indices, the DNSI has also undertaken nation-wide budget expenditure studies. Staffed by well-trained "pure statisticians", data are collected at monthly and annual intervals. Coverage extends to all the administrative levels including the geographical areas managed under the various ODRs (rural development organizations).<sup>31</sup>

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<sup>30</sup> The brief descriptions of the following institutions are based on interviews with Malian SIM employees and various MSU-CESA publications, especially Dembélé and Steffen (1988).

<sup>31</sup> For administrative purposes Mali is divided into villages, arrondissements, cercles, regions and finally the national level (i.e., capital).



*Users.* The typical output of DNSI is generally medium to long-term in nature and is published in a monthly or annual bulletin. In the cereals subsector, the economic actors who comprise the private sector are mostly small-to-medium sized firms which typically lack sufficient analytical capacity to analyze and thus use DNSI reports. Moreover, the information product is diffused in written form, in French, further precluding the small entrepreneurs (who tend to be less literate) from employing DNSI products in their decision-making. Therefore, users of DNSI data are primarily from the public sector and include ministries, research organizations and development projects.

*Trade-offs.* Should or can the DNSI provide the data collection activities of a SIM? What role, if any, can DNSI play in the information subsector? As alluded to, the objectives of a SIM are to provide reliable, timely market news that is accessible to all market participants. The DNSI certainly has the technical capacity to collect data on market news variables and has collected, *inter alia*, price data for several years. However, a key concern is with timeliness. Because the DNSI emphasizes "statistically correct" procedures, more time is required to process raw data into information, which may result in dissemination delays, thus compromising the SIM objective of timeliness. On the other hand, the SIM and the DNSI enjoy a close working relationship. In fact, the DNSI is an important member of the technical oversight committee that meets periodically to review SIM methods and review draft publications. In terms of collecting data on market news variables, the DNSI's role in the information subsector is best served as one of technical assistant.

#### **4.2.2   Système d'Alerte Précoce (SAP) or Early Warning System**

*Location and scope of activities.* Located in the Ministry of Interior and attached

to CNAUR (see below), the overall goal of the SAP is to inform Malian officials and donors about the overall food security of the population in areas considered chronically vulnerable to drought.<sup>32</sup> The SAP's responsibilities include monitoring chronically food-deficit zones to protect the purchasing power and health of populations at risk of food shortage. The SAP employs its own field enumerators (and occasionally personnel of other agencies) who live in food-deficit zones among the villagers. Data are collected on a monthly basis at the arrondissement, cercle and national level.

*Users.* Users of SAP data are from the public sector. The information is disseminated in written form (in French) and hence is less accessible to the illiterate.

*Trade-offs.* In terms of the feasibility of the SAP performing the data collection activities of a SIM, since the primary objectives are vastly different, the reliable collection and timely diffusion of market news may be given low priority. Nonetheless, because the SAP does have field enumerators it has played a significant role in the information subsector by monitoring markets for the SIM.<sup>33</sup> Motivation and incentive to monitor markets regularly varies among enumerators. Indeed, SAP enumerators have been known to shirk and thus require constant monitoring and supervision, highlighting the need to cross-check the quality of the data. However, the cost of monitoring is very high. In addition, enumerators need to understand prices and market dynamics. As employees of the national grain board, the SIM enumerators (relative to SAP enumerators) appear to have a greater understanding of the grain market.

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<sup>32</sup> The Ministry of Interior is responsible for aid to drought victims and the monitoring of internal migration.

<sup>33</sup> As of September 1991, the SAP no longer collects data for the SIM, due partly to suspicions of data manipulation.

### 4.2.3 National Commission for Emergency Aid and Rehabilitation (CNAUR)

*Location and scope of activities.* CNAUR is the Malian agency concerned with emergency aid and rehabilitation activities. Its responsibilities include identifying food-deficit zones and working with the PRMC concerning food aid distribution.<sup>34</sup> CNAUR does not employ field enumerators but relies on data collected from other agencies; in fact, the SAP is the technical arm of CNAUR. In effect, CNAUR centralizes data relevant to its objectives. The frequency of data collection and dissemination depend on the type of data collected. Most are handled on a monthly or annual basis and cover all administrative levels.

*Users.* The information centralized by CNAUR is in written form for internal use and thus is largely inaccessible to many members of the private sector.

*Trade-offs.* Since it was created to deal with crises, the primary disincentive for CNAUR to perform data centralizing activities for the SIM is its complex crisis-driven agenda, which may put SIM activities at the bottom of the priority list.

### 4.2.4 Rural Development Organizations (ODRs)

*Location and scope of activities.* Attached to the Ministry of Agriculture, Livestock and the Environment, the objectives and responsibilities of ODRs are broad. In general, ODRs are geographically focused integrated rural development projects or extension services that specialize in cereals and/or cash crops. The goals of an ODR are to improve production of food and cash-crop production and marketing by extending better production techniques and by providing credit and marketing services for

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<sup>34</sup> PRMC is the French acronym for the Cereals Market Restructuring Project, created and financed by a multi-donor group.

producers in the ODR's zone of operation. In Mali, there are several ODRs with varying capabilities, resources and visions.

*Users.* The data the ODRs collect are regionally focused and primarily published as internal documents, which are generally not widely disseminated outside the Ministry of Agriculture.

*Trade-offs.* Since there are geographic regions that do not fall under the patronage of an ODR, having the ODRs provide the data collection services of a SIM would imply that not all regions would be covered and the information would be regionally biased. However, by nature of their mission, the ODRs likely possess the best production information and do in fact have working relationships with several of the organizations described in this chapter. For example, the ODRs provide production statistics to the DNSI and could play an important role when the SIM expands to include quantity information. Additionally, ODRs have access to telephones, vehicles and a radio system (RAC) which could facilitate data transmission.

#### **4.2.5 National Directorate of Economic Affairs (DNAE)**

*Location and scope of activities.* The DNAE, attached to the Ministry of Finance and Trade, is the agency formerly charged with enforcing government regulations on commerce, including the grain trade. As a regulatory agency, DNAE's scope of activities include regulating the importing and exporting of cereals, including organizing and monitoring trade flows and participants; and all other commercial regulations, including licensing procedures.

The DNAE employs its own field personnel to collect data and also uses data collected by other agencies. The data are collected at various frequencies (e.g., weekly,

monthly, quarterly, annually); however, the information is essentially published for internal use only and is not widely disseminated outside the Ministry of Finance.

*Trade-offs.* The problem or potential trade-off with the DNAE performing the data collection activities of a SIM would first and foremost be the lack of merchant trust, which could directly affect the quality of the data. Since the DNAE was in charge of enforcing government commercialization rules, private traders largely distrust DNAE. Consequently, DNAE would likely encounter difficulties in obtaining "true" prices from the various economic actors. In fact, on occasion the SIM enumerators have been mistaken for DNAE agents and faced this very problem. Moreover, the reputation of DNAE is such that it is feared that it might manipulate price data to conform to government objectives, effectively spoiling the reputation for reliability.

It should be noted that the role of DNAE is evolving with time. For example, it used to enforce control prices on grain and license importers and exporters. However, control prices no longer exist and import and export licenses are no longer required, thus, theoretically reducing the policing activity and the negative stigma attached to DNAE. Therefore, with time, the DNAE could play an increasing role in the information subsector, particularly by contributing to analytical products.

#### **4.2.6 Private Trader's Information Systems**

Prior to the 1989 implementation of the SIM, there existed a formidable informal information network among the various traders. This network has not disappeared with the creation of the SIM. Information travels by telephone, letters, telex, radio system and drivers. Some of the larger wholesalers located in strategic grain marketing zones benefit from connections within the Chamber of Commerce as well as other strategic

contacts. Occasionally traders employ an apprentice to accompany the driver hired to transport grain. The apprentice's task is to monitor cereals flows and prices. Information collected by traders is inaccessible outside the trading partnership. Due to the economic characteristics of information, the private sector will unlikely supply information at a socially optimum level.<sup>35</sup>

#### **4.2.7 Ad hoc Projects**

Several other organizations have mounted smaller efforts to meet their specific data needs. Many of these organizations are development projects or research organizations that require baseline data for project evaluation or research purposes. The data is generally for internal use.

#### **4.2.8 Famine Early Warning System (FEWS)**

*Location and scope of activities.* FEWS is not a local institution in the true sense; however a description of the Malian information subsector would be incomplete without it. Conceived and financed by USAID, FEWS is an information system that aims to reduce the risks of famine by identifying early, potential food supply and access problems. Essentially a food security monitoring agency, FEWS regularly collects data from national services such as the SIM and SAP and then adds value to it by structuring it in a particular format and developing analytic tools to look at the data. The restructured data and programs are then made available to national institutions.

*Users.* Originally created to inform the USAID Mali mission and its Washington

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<sup>35</sup> These economic characteristics of information are discussed in Chapter Two.

headquarters, FEWS Mali now sees itself as having a national clientele that includes, inter alia, private voluntary organizations (PVOs) and university researchers. Diffusion is in written form.

*What role can FEWS play in the information subsector?* FEWS does not have the budget to engage in data collection activities; however, part of its mandate is the institutionalization of data collection skills, i.e., technical skills. As a member of SIM's technical commission, FEWS has already provided some technical assistance to the SIM. In addition, because FEWS collects similar data across several countries of the Sahel, it could play a major role in the development of a regional information system by making data on neighboring countries available to national MISs.

#### **4.3 Analytic Groups**

The problem statement indicated that strengthening the analytical capacity of the public cereals market information system in Mali is one of the current challenges facing the SIM. However, what do we mean by analysis? Analysis is often confounded with description, yet the distinction is vast. Analysis is a process whereby questions or problems are identified, reasoning about these questions takes place, implications are determined, and based on the application of both theory and empirical information, conclusions are drawn. The operative word is process. This process is used as a method for studying the nature of something (such as understanding why grain prices are higher in one market versus another) or of determining its essential features (such as a poor transport system). Thus, in this context, description is but a tool employed in analysis. In order to assess the impact of alternative decisions effectively, a thorough understanding of the analytical process is necessary. The following is a brief description

of the current local institutions that have, or could potentially have, the analytical skill (as defined here) required to meet the challenge.

#### **4.3.1 Rural Economics Institute (IER)**

IER, attached to the Ministry of Agriculture, Livestock and the Environment, has as its fundamental mission to undertake applied research in the agricultural sector and advise government officials. Clients or users of IER analytical products are the various ministries, research institutions, projects and international development organizations. Dissemination is generally in the form of written publications or the release of improved agricultural technologies to the extension services. The IER staff is comprised of, among others, university-trained economists, agricultural economists, engineers, crop and animal scientists. IER has on several occasions "loaned" out or assigned employees to collaborate with various organizations on specific studies. It also has experience contracting out its services for a fee.<sup>36</sup>

#### **4.3.2 Educational Institutions**

In order to expand its in-depth analyses, it has been suggested that SIM consider entering into cooperative agreements with the national schools of higher education. This would be similar to the U.S. model where USDA has cooperative agreements with universities and other research institutions to perform analyses of special interest to USDA. However, Mali does not have any universities. Rather, it has specialized schools

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<sup>36</sup> Like several research institutions throughout the developing world, IER suffers from a paucity of operating funds. Hence when its services are demanded, mission (logistics and per diem) and publication costs must be covered by the contracting organization. Consequently, most of the research undertaken by IER is financed by external sources.



of higher education, such as the National School of Administration (ENA), the Rural Polytechnical Institute (IPR) and the National School of Education or the Teachers Training College (ENSUP). These three schools could potentially rise to the challenge.

1. National School for Administration (ENA), Rural Polytechnical Institute (IPR), and the National Teachers Training School (ENSUP).

Located in the Ministry of Education, the primary responsibilities of ENA, IPR and ENSUP are higher education and training. ENA trains government administrators as well as statisticians and economists. The agriculturalists, animal scientists, and foresters graduate from IPR, while the biologists, mathematicians, linguists, among others are trained at ENSUP. The instructors at these schools generally possess masters or doctorates. To date, data collection and research activities have been largely for student papers, while dissemination occurs in the form of student theses, published academic articles and, more recently, newspaper articles by faculty.

Interviews with Malian graduates of ENA and IPR identified certain characteristics of these institutions which could pose potential threats to translating the U.S. cooperative agreement model to Mali. First, these institutions focus more on the theoretical and less on applied issues. Consequently, if students lack ample opportunity to apply their knowledge, the skill required to perform in-depth analysis never fully develops. The questions becomes, does the required analytical capacity exist at these schools as they currently operate? Is applied work by students and faculty rewarded? Or is it considered not academic enough?<sup>37</sup> In addition, SIM analyses focus on

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<sup>37</sup> There is an impression that institutions like ENA are growing more accepting of applied research, but the question of the rewards for different kinds of research still needs to be raised.

market dynamics, and presently there are no programs that provide training in marketing. Secondly, if contracts (cooperative agreements) are awarded to any of these schools, who will manage the research funds? The dean? The professor? What are the incentives against opportunism?

Involving the institutes of higher learning in performing analyses for the SIM would be an excellent opportunity to develop local analytical capacity for students as well as professors. A model similar to the professor/graduate assistant relationship in the U.S. system could be established. Moreover, for student theses, the possibility of involving professors and their students in SIM analysis might be feasible. Indeed, some collaboration along these lines has occurred with several students from ENA interning at the SIM and subsequently using SIM data in their memoires (final reports). In addition, under the INSAH/PRISAS program, SIM researchers have agreed to collaborate with several of the institutes of higher learning as well as the CMDT, one of the rural development organizations, on a maize subsector study<sup>38</sup>.

#### **4.3.3 Ministry of Plan**

The Ministry of Plan is divided into two divisions: DNSI and Plan. DNSI as described above is the statistical arm, and Plan, using DNSI output, as well as other secondary sources, performs the analyses for the Ministry. In particular, the Ministry of Plan defines and determines the orientation of economic development policy for the country. Five-year plans are the result. Occupied with deciding the overall investment

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<sup>38</sup> INSAH = The Sahel Institute, a regional research institute based in Bamako. PRISAS = Regional Program for Strengthening Institutional Research Capacity on Food Security in the Sahel. The INSAH/PRISAS program coordinates research activities aimed at improving the food security of Sahelian populations.

plan of the country, it hardly seems feasible that the Plan would give priority to the analytical needs of SIM clients.

#### **4.3.4 ODRs**

The ODRs are mandated to provide agricultural extension services to the producers in a geographic region, and consequently, information disseminated by these institutions would be biased towards their regions. ODRs are usually staffed by graduates of the aforementioned schools of higher learning or vocational schools, and thus may also face underdeveloped analytical capacity. However, there probably is scope for the ODRs to work with the SIM to develop marketing extension materials targeted to farmers in various ODR zones.

#### **4.4 Diffusion Services**

In addition to data collection and analytical services, the Malian market information subsector includes structures that publicly diffuse market information. The following is a brief description of the major relevant organizations.

##### **4.4.1 Radio and Television of Mali (RTM)**

RTM is the public radio and television station in the capital city, Bamako. There are a few other public radio stations in select regional capitals. Less than a year ago, the first privately owned radio station was unveiled in Bamako. Currently there are two, with limited-range FM transmission.

The Minister of Finance (in charge of the SIM) and the Minister of Information (in charge of RTM) officially agreed that RTM would diffuse on a weekly basis (at zero

cost to the SIM) price information for the SIM. Some years before RTM had entered a similar agreement with the Ministry of Livestock to diffuse livestock prices. However, the RTM staff, far removed from the Ministry of Livestock, saw little value in this task, and thus, implementation (i.e., regular dissemination of livestock prices) met with some problems. To avoid similar obstacles, the SIM agents work hard at maintaining good working relationships with RTM agents.

The SIM currently covers 8 commodities in 58 markets. Prices are broadcast weekly (Fridays at 3:00 p.m.) in the local language, on a radio market news program which includes price ranges, prices of the current week compared to prices of the previous week and the identification of the markets with the highest and lowest price that week. Saturdays at 7:00 p.m. a popular television show, the "Gourmant Gourmet", communicates the SIM prices. According to SIM employees, the performance of the contracting relationship between RTM and the SIM is very high<sup>39</sup>.

#### **4.4.2 Newspapers (Kibaru, Eссор and Djé ka Baara)**

Kibaru and Eссор are public newspapers that publish SIM price tables, on a regular basis, at zero cost to the SIM. The Eссор, a daily newspaper (except Sunday), publishes in French the SIM price information (on a biweekly basis) from the preceding week and the current week, along with brief commentary. Kibaru, a monthly publication, written in the dominant local language, Bambara, diffuses the same information as the Eссор. Djé ka Baara is a monthly Bambara journal published by the one of the ODRs

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<sup>39</sup> As noted above, under new political leadership the RTM will likely be privatized. This has direct implications for the performance of the existing contractual relationship between the RTM and the SIM. The SIM may henceforth have to budget for radio and television air space.

(CMDT) for the farmers in the CMDT zone.

#### **4.4.3 Bulletins and Annual Reports**

The SIM itself publishes in French a weekly, monthly and semi-annual bulletin. The information includes grain prices as well as brief commentary. Recently, the SIM began a working paper/report series, which includes more in-depth analyses of specific issues.

The weekly and monthly bulletins report short-term price movements, while the semi-annual bulletins include analyses of seasonal price movements and the impact of new policies, as well as provide information on regulations, agricultural credit, import prices, and food aid distribution. Additionally, each semi-annual bulletin features one article on a special topic such as the forces driving the price of a particular commodity over the last year.

In addition to the above services or functions, the ability to transmit data from the field to the central office of the SIM is a critical consideration. Currently the SIM relies on the local governmental administration's radio system (RAC) to transmit field data through several administrative levels and eventually the SIM itself. A well-coordinated data transmission system is critical in assuring the timeliness of information diffusion. Organized in this manner, data transmission for the SIM is subject to exogenous shocks, such as RAC failure or mistranscription of the enumerators' figures by the government employee sending the price information by radio or by SIM employees receiving it.

The purpose of the above sections was to briefly identify and describe the major institutions and agencies in the Malian information subsector that possessed the greatest

capacity to perform one or more of the services of an MIS.<sup>40</sup> The following section summarizes the evolution of the Malian SIM, including a description of the current structure and organizational arrangement and concludes by assessing the performance of the current arrangement.

#### **4.5 The Evolution of the SIM**

The establishment of the official cereals market information system in Mali began in March 1988, with the setting up of a transitional information system, referred to as the SIT. Due to the public-good nature of information, it was determined early on that the information service would be supported by the public sector. An initial CESA-MSU study by Dembélé and Steffen (March 1988) indicated that several institutions were collecting various types of market information. Thus, given the resource constraints of Mali, the SIT was envisaged as a coordinating unit that would centralize and rationalize the types of market information currently being collected. Specifically, it would harmonize three existing market monitoring efforts: studies funded by the Canadian International Development Agency (ACDI), CESA-MSU studies and OPAM's monitoring of retail prices in the then seven regional capitals.

The objectives of the SIT were to: a) harmonize data collection methodology of the three selected systems; b) train OPAM staff who were in charge of data collection and processing, analysis and dissemination of information; and c) act as nexus for reflection on the design of the permanent SIM (OPAM 1988).

According to a November 1988 evaluation, the SIT successfully harmonized the

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<sup>40</sup> The services or components of a market information system are described in detail in chapter 2.

data collection of ACIDI, OPAM and MSU-CESA; processed and disseminated market information regularly; defined an organizational structure (refer to figure 5) for the SIM; identified markets to be covered; devised a budget; defined an analysis scheme and developed a framework for presenting the data; created capability for OPAM to process data and elaborated a diffusion model (OPAM 1988 p.3). The goal then became one of identifying a Malian institution capable of objectively performing the above duties, while also collecting necessary data that were not yet being collected. Once the necessary questions were addressed and the designated staff acquired sufficient experience, the SIT was gradually developed into a permanent system, the SIM. The SIM became operational in late 1988.

#### **4.5.1 The Permanent SIM**

One of the key questions in the design of the SIM was where to locate it. An informal planning group affiliated with the SIT, which included technical assistants contracted by MSU-CESA, undertook an informal survey of the statistical services in Mali.<sup>41</sup> This survey was complemented by a study undertaken by an IER researcher/consultant which further identified the type of data collected (e.g., prices, imports, quantities), the frequency of collection, the geographic area of collection, and secondary sources, among others. After assessing the trade-offs of alternative agencies such as the DNSI, the DNAE and OPAM, the technical assistants concluded and recommended that OPAM, because of its experience in cereals trade, was in the best position to house the SIM. That experience included knowledge of grain varieties and

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<sup>41</sup> The survey included questions on the age of the institution, organizational mandate, number of professional staff, data processing equipment, number of researchers on staff, type of data currently collected and how were they used, etc.

quality, critical for explaining price variations in the markets. After discussions with the PRMC, ACDI, the Ministry of Finance, and working groups at a national SIM conference, the decision was later finalized by the Ministerial Council (Conseil des Ministres). Consequently, the SIM became a division of OPAM's Food Security Directorate. To gain a greater understanding of the context within which the SIM operates, a short history of OPAM is presented.

#### **4.5.2 Official Grain Board (OPAM)<sup>42</sup>**

The national cereals marketing board, OPAM, initiated essentially as a mechanism for instituting official grain policy, has undergone a structural transformation in which its role has evolved with the political and economic regimes. Private grain marketing was officially prohibited from 1965 until liberalization in 1981.<sup>43</sup> Prior to 1981, OPAM, a government corporation, operated as the sole legal trader of foodgrains. The government, through OPAM, controlled prices and decreed procurement quotas for producing zones.

From 1964-82, OPAM's commercial objective was to buy and sell cereals for a profit through nation-wide commercial outlets. In theory, OPAM managed its own operating budgets but was obliged to transfer a portion of its annual profits to the national treasury. In reality, OPAM suffered from lack of management and financial autonomy in that the Minister of Finance dictated decisions to OPAM. Moreover, the state-controlled prices were fixed without regard for market conditions, effectively

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<sup>42</sup> This section is based on Steffen (1990).

<sup>43</sup> Although in reality OPAM handled only 20-40% of total grain marketed in the country (Staat et al. 1989, p.704).



usurping from OPAM any financial autonomy and leading it into financial disaster.<sup>44</sup> Finally internal mismanagement, political interference and conflicting objectives drove OPAM to corporate disaster.

In 1981, under the auspices of the PRMC, OPAM and the grain marketing subsector were reorganized. Restructuring OPAM called for tighter management, reduced staff<sup>45</sup> and stricter controls of stocks.<sup>46</sup> In 1982, the new objectives of OPAM included the management of general cereals marketing, supplying grain to food-deficit zones, management of the national security stocks, supplying cereals to public interest services (e.g., the military), supporting official consumer and producer prices through market stabilization operations, and managing and distributing food aid.

Forced to comply with a pricing system that did not reflect market conditions, OPAM was unable to maintain its role as market stabilizer. Thus, OPAM's fundamental mission altered again in 1987 to that of manager of national security reserves, supplier of food-deficit zones, and manager of food aid distribution. Consumer and producer prices of all cereals with the exception of paddy rice were liberalized. Efforts to make OPAM more efficient continued. Finally in 1988, its current mission was delineated, namely safeguarding minimum food security levels in hard-to-reach, high-risks zones, assuring food-deficit zones of cereals supplies, and managing and distributing food aid. A secondary mission to provide market facilitating services, such as the SIM, was

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<sup>44</sup> In 1977, net income before subsidies was a negative 2088 million CFAF (approximately US \$10M). By 1988, the deficit was reduced to 292 million CFAF (Steffen 1990, p.11)

<sup>45</sup> With staff cutbacks at the regional and national headquarters, 350 of OPAM's 718 personnel were forced into early retirement by the end of 1988 (Steffen 1990, p.22).

<sup>46</sup> Thefts of grain stocks had been a problem, which was compounded by poor inventory controls.

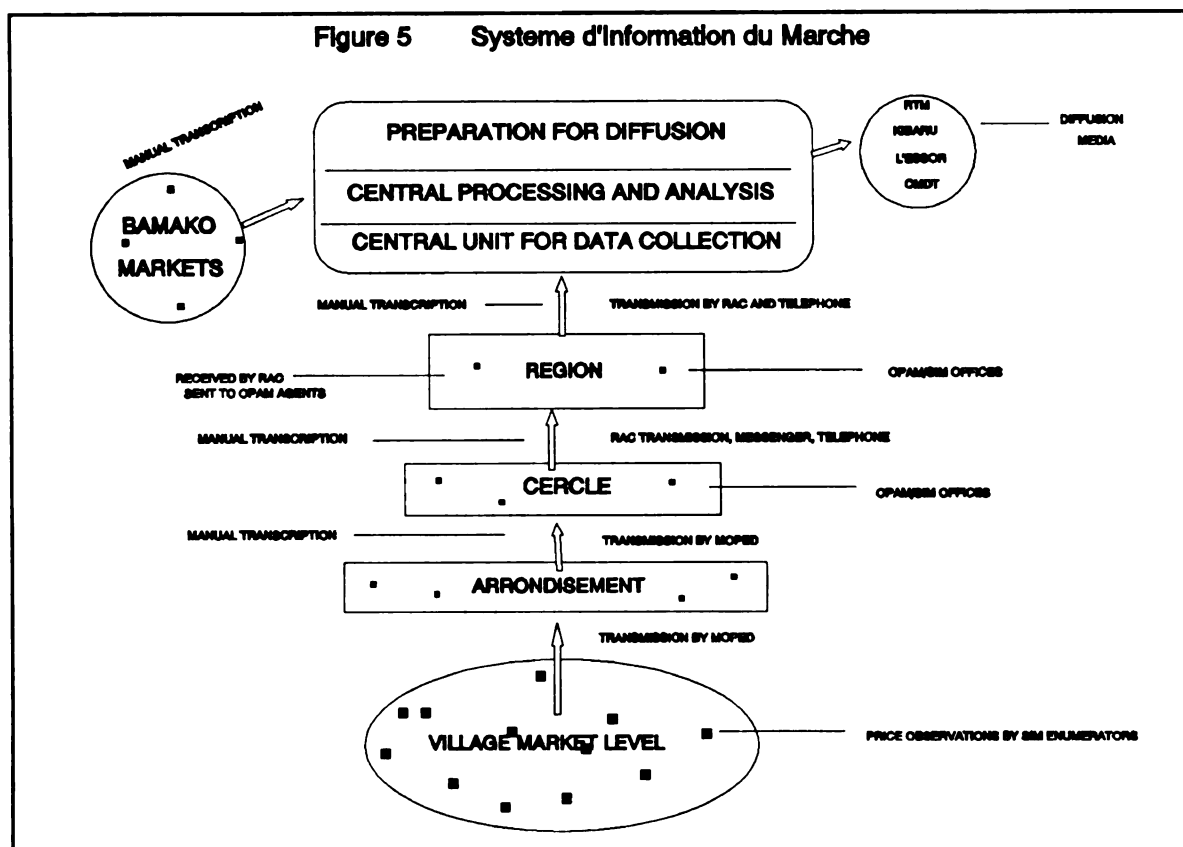
appended.

In conclusion, OPAM is supposed to be a self-financing commercial operation, at zero cost to the Malian taxpayers. However, because it is also charged with non-commercial activities, it is difficult for OPAM to break even. In reality, both the SIM and the national security stocks (SNS) are financed through donor funds and much of OPAM's revenues come from donor resources, in the form of food aid, which OPAM sells. The SIM, currently a division of OPAM, is fast becoming one of the most important functions of OPAM.

#### **4.6 Performance**

Coordinating and implementing a market information system is no easy task for countries with fragile resource foundations like Mali. Conceptualizing the SIM as a coordinating unit was pragmatic in that it allowed Mali to economize on financial and intellectual resources as well as capitalize on local experiences.

Nevertheless, if the SIM was to get off the ground, sound financial commitments had to be made to compensate SIM personnel and pay for initial investment and operating costs. To date, the SIM has been entirely funded by the PRMC and USAID (through support provided by MSU's Food Security in Africa Cooperative Agreement). Some of the challenges confronting the SIM are irregular monitoring of markets, shortage of supervisory personnel for cross-checking enumerators, a shortage of supporting office staff and computer-literate personnel and late transmission of data. In fact, the transmission of data from the field to the central processing offices is tainted with problems. The transmission chain is too long, creating multiple error effects. (See figure 5). For instance, as indicated above, the SIM does not own or control



transmission equipment and thus is forced to depend on the administrative RAC system. Data are manually transcribed four different times in this system. That is, civil servants read the enumerator's observed prices over the radio while another civil servant receives and manually transcribes the data. However, often the SIM items are given low priority and thus must wait until the administrative messages are transmitted. Moreover, once access is authorized, data are frequently incorrectly transmitted, effectively hindering the smooth functioning of the SIM.<sup>47</sup>

In terms of strengths, the SIM has become the overriding authority on grain price

<sup>47</sup> Market reports are also mailed into Bamako as a cross-check. That is, mistakes in the RAC transmission can be corrected in the historical data base (used for the longer-term analytic products), although the mailed reports arrive too late to be incorporated in the weekly market news reports.

information in Mali. Many of the other statistical organizations rely on SIM data to cross-check their own data, or simply find it more effective to use SIM data. The SIM's greatest asset is its reputation for reliable, objective and timely information. Internally, the SIM benefits from the motivation and solid commitment of its personnel as well as its interest in fostering open dialogue with interested parties. The success of a SIM is a function of the demand for its output; if the information product continues to be demanded, then the SIM can be considered effective. In fact, SIM employees recount anecdotes of merchants who have understood the utility of price diffusion (in terms of stimulating competition between markets), and have gone directly to the SIM office to make sure that the prices in their markets are being reported. However, now that demand has been created for SIM data, how can the subsector be organized to meet those needs better? Towards this end, the following chapter defines transaction costs in the context of the information subsector and analyzes the trade-offs among alternative organizational arrangements for the SIM.

## **CHAPTER 5**

### **FORMALIZING AND APPLYING THE FRAMEWORK**

#### **5. Introduction**

The previous chapters examined varied conceptual, theoretical and empirical issues that influence the design of an MIS. This chapter attempts to formalize the framework by translating the design guidelines discussed in Chapter 3 into transactions costs, and identify and discuss alternative organizational forms as well as examine the trade-offs of various organizational scenarios for the MIS in Mali.

#### **5.1 Transaction Costs in the Context of the Information Subsector<sup>48</sup>**

As discussed in Chapter Two, most of the literature defines transaction costs as information costs - specifically, *ex ante* measurement or search costs and *ex post* costs associated with uncertainty of exchange, i.e., monitoring and enforcement. Furthermore, a review of the theoretical literature on the economics of information confronted with the empirical evidence or lessons learned from other countries indicates that there are four critical parameters that the products of any information system must possess: reliability, timeliness, accessibility and objectivity. Reliability refers to the quality (minimum error and utility) of the data; credibility refers to the unbiased objectivity of the statistical or analytical product; accessibility refers to equal access for all targeted users; and timeliness refers to the continuous and consistent diffusion of information.

To facilitate the development of a transaction-cost framework for analyzing the trade-offs of alternative organizational arrangements, the basic unit of analysis, the transaction cost, must be defined. In the context of the information subsector, two types

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<sup>48</sup> As discussed in chapter 4, information subsector and MIS are used interchangeably.

of transaction costs can be identified: 1) *ex ante* costs associated with reliability, objectivity, accessibility and timeliness of the information product; and 2) *ex post* costs associated with monitoring the reliability and credibility of the information product.

Williamson (1985) discusses asset specificity and its role in determining organizational form. In examining the organization of the MIS two types of specificity come to mind: temporal and reputation. Temporal specificity is present when a product's value is inherently time-dependent, such as information (Masten 1991). When specificity exists, Williamson refers to the threat of "hold-ups" occurring when the timing of performance is critical (such as the timely transmission and dissemination).<sup>49</sup> Therefore, the prospect of strategic delay is a major concern in the private (and sometimes public) provision of information. For example, in Mali, the SIM depends on the administrative radio system for the transmission of field data to the central office. If, for example, the national administration felt that the dissemination of SIM's data adversely affected national policy objectives, the administration could conceivably block or delay (hold-up) the transmission of field data.

Reputation specificity is present when the product's greatest asset is its reputation. This is related to Williamson's externality principle and is often cited as a factor leading to vertical integration. "Externality concerns arise in conjunction with a branded good or service that is subject to quality debasement" (Williamson 1985, p.112). An MIS cannot afford to disseminate poor quality information. Much of the coordination task in organizing for the production of information is related to assuring

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<sup>49</sup> Hold-ups relate to incentive systems and the division of gains and are tactics by which one party can realize an advantage over a rival by credibly "tying one's hands" (Williamson 1985, p.167). There is often a tendency of at least one party to a transaction to act opportunistically to try to appropriate the quasi-rent generated by his trading partner's specialized asset (Staatz 1988).

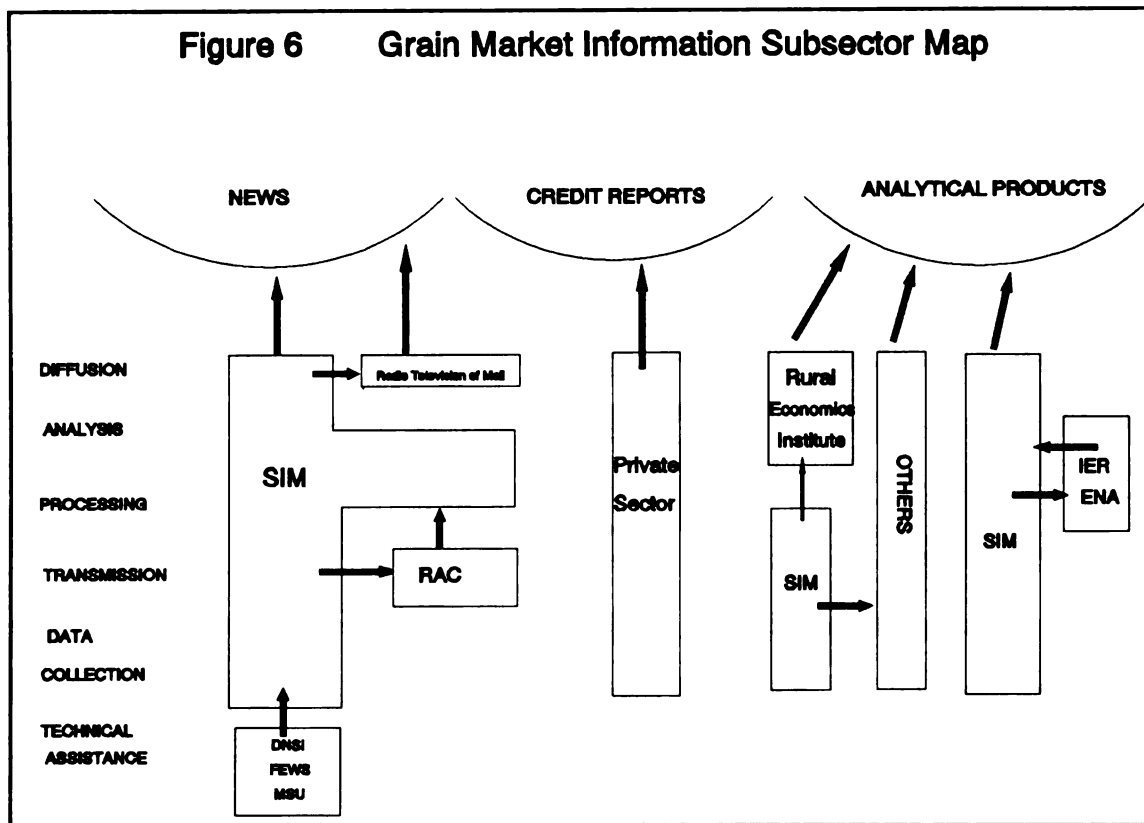
that quality data are collected and transmitted. Analogously, if the private sector (e.g., traders) were charged with providing information services, it is not unrealistic to envision (in the Malian context) that for the right price, information could be sold prematurely to paying clients, and later disseminated to the larger public.

### **5.1.1 The Makings of a Framework**

In an effort to identify the parts of the framework, this paper will look at the organizational possibilities for producing three types of market information and intelligence: price and quantity information, referred to as "news"; credit information; and situation (e.g., studies of market structure, conduct, performance) or outlook (e.g., short-term forecasts) reports, referred to as analytical products. These types of information require different production and demand considerations and have different users. By examining alternative organizational forms and institutions in the information subsector, this paper traces the production of these types of information through the vertical chain to the end-user to ascertain where the transaction (measurement, monitoring and enforcement) costs would occur. (See Figure 6). First, however, the next section briefly reviews the organizational forms currently found in the subsector.

## **5.2 Alternative Organizational Forms**

The organizational question has two dimensions: first, who should provide information products (private or public sector) and second how should the production



be arranged (integration, spot market exchange, contractual arrangements, etc.)?<sup>50</sup>

This section briefly describes the alternative means of coordinating or organizing the production of information products and discusses some of the associated implications.

**5.2.1 Vertical Integration** or internal organization occurs when two or more adjacent stages (such as data collection and transmission) under single (or collective) ownership are coordinated by intrafirm administration (Marion 1986, p.82). That is, coordination of the stages is controlled within one institution. As discussed above, asset specificity and externality factors often lead to vertical integration because in a vertically integrated

<sup>50</sup> Riemenschneider 1979 sees only three general organizational arrangements as being feasible: specialist (private) firms; collective provision such as a trade association, or government provision (Riemenschneider 1979, p.18).

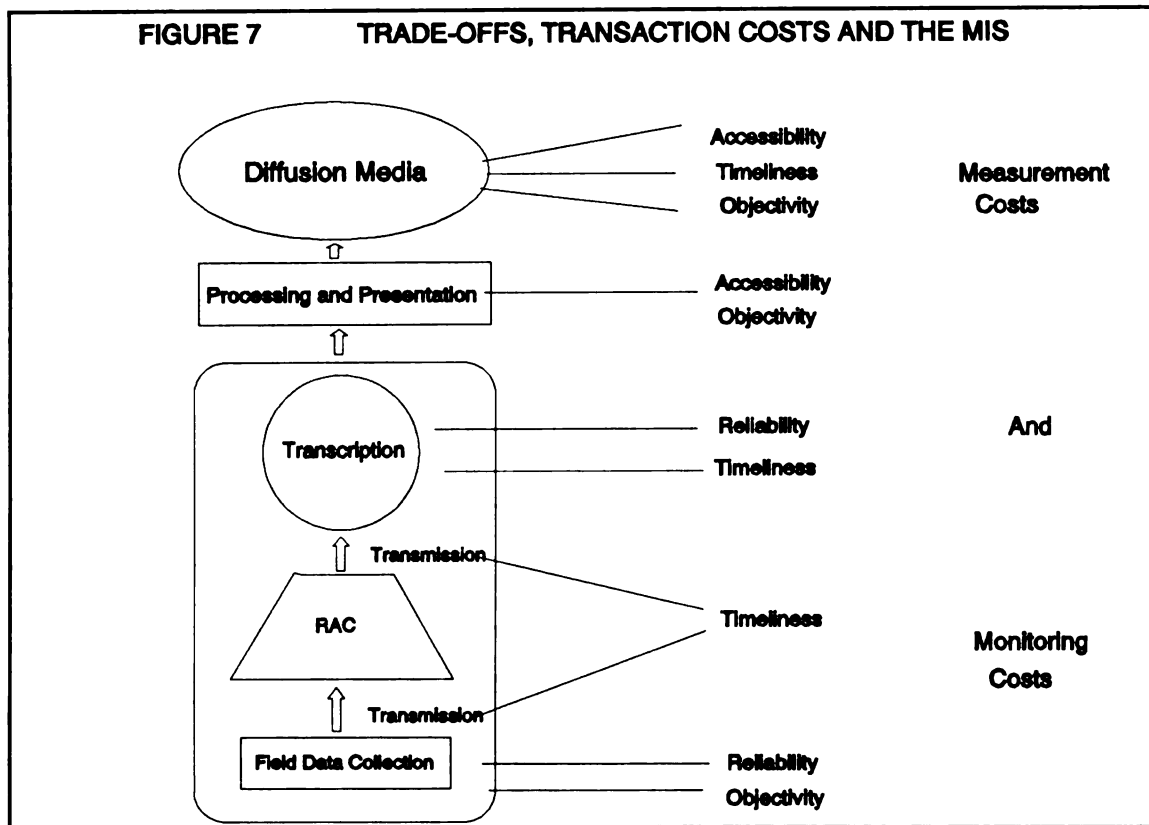


arrangement, management has greater control over product quality (reputation specificity), accessibility and timeliness (temporal specificity). For example, if quality variability is inherent in the data collection process (cross-checking of enumerators is not regular) but not verifiable at a reasonable cost, prior to using the information, this quality uncertainty may be sufficiently high to move towards integration. Thus, combining the data collection, transmission, processing and dissemination stages may reduce variations in product quality by giving the MIS providers greater control over each stage.

Technological interdependence of stages (again such as data collection and transmission) may suggest that separation of these stages among different organizations has high transaction costs.<sup>51</sup> Organizing data collection in one entity and data transmission in another may subject the MIS provider to additional errors of transcription. Enumerators are more familiar with, for instance, the price figures and thus are more likely to notice a transcription or interpretation error than a government employee simply charged with transmitting the data. Also separating these stages exposes the provider to "hold-ups". In short, the gains from integration are greater control over quality - the most important asset of the MIS - and timeliness, both of which determine the value of the data to the user. Decisions to integrate are based on, *inter alia*, transaction costs savings that spot market exchanges are unable to realize. Figure 7 depicts the MIS system and highlights the areas where transaction costs are likely to occur. It is necessary to note that there are limits to how many activities (stages)

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<sup>51</sup> Technological interdependencies also help determine the scope for horizontal integration. That is, there may be large scope economies in collecting data on several different products (e.g., cereals and vegetables) traded in the same physical markets rather than organizing a separate MIS for each product group.



can be effectively controlled internally. Masten (1991) posits that bureaucratic inefficiencies can plague large organizations, increasing the probability of mistakes and the costs of organizing.

**5.2.2 Spot Markets** or simple market exchange. In simple market transactions parties are generally free to supply or not supply as they please, and once the transaction is consummated, the parties have few ongoing obligations. Rather, the transactors have the latitude to adapt their behavior to events and information as they arise. This flexibility, however, exposes transactors to potential hold-ups or free-riding (Masten 1991, p.7). The spot market suffers from high transaction cost uncertainty associated with reliability, timeliness and availability of product. For instance, can the seller deliver? Contracts

and integration can be used to reduce some types of uncertainty, which may result in lower transaction costs relative to spot market transactions. The spot market will generally continue to exist, though, as a residual market, to compensate for errors in estimation of supply and demand for information products, and if the accessibility features of the MIS break down.<sup>52</sup>

Spot market exchanges in the information subsector in Mali could potentially arise for analytical products and credit reports. It is not uncommon to find unemployed graduates and researchers who also work as consultants. Through these endeavors a supply of private providers of analytical products could be developed. Since there are likely to be substantial scale economies involved - i.e., not all these consultants understand grain markets - the expertise will likely be initially concentrated among SIM staff. Thus, the SIM reports may initially help stimulate demand (i.e., develop the market) for these types of products. The market then could expand into the private sector<sup>53</sup>.

In terms of credit reports, the banks provide formal credit and some larger-scale traders provide informal credit and thus have collected credit information on their clients. Currently, formal credit reporting services are not provided by either the public nor the private sector in Mali. However, if these services are provided informally, it is likely that the transactions are coordinated via spot market exchange or non-monetary exchange of information among traders.

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<sup>52</sup> Coordination by spot market exchange may reduce accessibility of information products to farmers (e.g., cost may be prohibitive or the physical market for the information product may be too far away).

<sup>53</sup> As the grain market matures and expands, the value (and therefore demand for) private sector specialized and complementary (to SIM) analysis will grow.

**5.2.3 Contracts.** Coordination by contract represents an intermediate position between spot market coordination and integration (Marion 1986, p.92). Contracting involves commitments to deliver and receive goods at some later time. They are risk-sharing mechanisms that stipulate the terms of trade *ex ante*. However, they can be costly in terms of enforcement and identifying all possible contingencies. Contracts are often used as a coordinating mechanism because they allow participants some of the benefits of internal coordination while still maintaining "high-powered market incentives" (Williamson 1985). Contracts can reduce transaction costs and reduce risks associated with accessibility and quality variation. A major impetus for contracting is to obtain the quality desired, so terms specifying standardization of quality in the contract become important, especially when the user (whether private or public) has very specialized decision information needs. Informal contracting (no written agreement) currently plays an important role in the organization of the SIM's data collection and dissemination services. However, formal contract arrangements could potentially play a critical role in expanding, vertically and horizontally, the capacity of the system.

Two other organizational forms are worth noting: specialized structures and cooperative integration. Specialized structures, a form of specialization in certain stages of the subsector, are organizations that concentrate on one (or more) of the stages of production or distribution: for example, one organization undertaking only data collection activities and another performing only analyses. Specialization is a function of firm comparative advantage or size economies.<sup>54</sup> It is the result of specialized skill or technology or asset specificity. Specialized structures can become integrated through

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<sup>54</sup> The term "firm" is used here to denote an agency or institution in the Malian information industry.

contractual agreements or vertical integration. As the market information subsector expands, the benefits of economies of size will likely lead to the proliferation of specialized information (private or publicly supported) firms.

Cooperative integration or collective action (such as a trade association) may arise to capture economies of scale in information production, especially if individual private producers are precluded from providing information needed and if others (e.g., the state) fail to supply it<sup>55</sup>. If producer commitment is present, this organizational form can capture some of the benefits from vertical integration. The medieval European Law Merchant is an example of how this could operate (Milgrom et al. 1990).

In short, the incidence of transaction costs vary among the alternative vertical coordination methods. The aim of public policy should be to coordinate or organize the production of information products by the means having the lowest costs. The nature of the commodity determines the most effective way of organizing for its production. Information as a commodity is subject to temporal specificity (loses its value with time) and externality problems (reputation). These attributes coupled with the high cost of measurement (accessibility and reliability) will determine which organizational arrangement is the most efficient in terms of minimizing transaction costs. These are the "parts" of the framework that will attempt to answer the following questions. In what way does a contractually coordinated subsector outperform a subsector coordinated through spot markets or vertical integration? What are the gains and losses from vertical integration versus specialized structures?

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<sup>55</sup> Some modern industrial country trade associations also collect and disseminate to members industry-wide statistics.

### 5.3 Formalizing the Framework

Given the above discussions of the critical parameters of information products, this section attempts to identify the trade-offs associated with alternative institutional arrangements of the Malian cereals market information system. The model or reference MIS discussed in this section satisfies all the design guidelines examined in chapter 3.

#### 5.3.1 The Organization of the Production of Market News

For our purposes market news refers to the collection and dissemination of price and quantity information, and analysis of market news data is simply the processing and ordering of raw data. Reliability, accessibility and credibility as attributes of information products are important for all information products discussed in this study. However, the relative importance of timeliness as an attribute of information products varies with the type of information being supplied. Timeliness is crucial for market news but less important for longer-term analyses of market dynamics. Again, the strategic importance of these attributes has direct implications for who should supply the various information products and how. The SIM is the only institution that currently provides market news and thus will be analyzed using the transaction cost framework.<sup>56</sup>

##### 5.3.1.1 The SIM

The primary objective of the SIM is to provide market "news" (although until recently it has only diffused price information). It is largely a vertically integrated structure that contracts for certain functions. (See figure 6.) Through an informal

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<sup>56</sup> Other organizations do collect price and quantity data. However, the SIM is currently the only institution that disseminates information on these variables as market news.

contract, the SAP used to provide price data for the SIM. Because the contract was informal, the SIM had no way of enforcing the agreement and thus no way of assuring product quality. The SIM incurred the costs of monitoring not only its own enumerators, but also those of the SAP. In September 1991, due to quality control and externality problems, the SIM "vertically integrated" into the markets covered by the SAP.

The SIM also has an informal agreement with the national governmental administration to use the decentralized radio (RAC) system to transmit field data to the central processing office. As cited above, timely and accurate transmission is critical for the timely and credible dissemination of information. Organizing data transmission by informal contract forces the SIM to incur significant measurement costs. According to some SIM employees, transaction-cost economies could be realized if the SIM controlled data transmission.

The SIM was created to provide timely and reliable information to the private sector, and thus can ill afford to possess less than complete control of data collection and transmission. From the transaction-cost perspective, vertical integration explicitly seeks to economize on measurement and monitoring (transaction) costs. In this context that means to maximize quality and timeliness. However, it should be noted that the trade-offs between the SIM controlling data transmission and hiring additional enumerators are essentially between potential better quality data and higher financial costs to the SIM. It is believed that the SAP and RAC resources are underemployed and hence are available at a lower cost than if the SIM set up an independent RAC system for one transmission per week or hired additional enumerators to cover only a couple of markets.

Diffusion of market news is also achieved via informal contracting. The

ministries in charge of the SIM and the radio and television network as well as the newspapers agreed that these various information sources would disseminate at zero (official) cost to the SIM, the SIM price data at agreed upon time frequencies.<sup>57</sup> Unofficial concessions between SIM employees and the employees of the organizations performing diffusion services for the SIM allow this arrangement to work smoothly. However, as the SIM expands its coverage to include quantity information and perhaps other variables in the future, or if the RTM becomes privatized, the costs of reliable and timely dissemination may become greater, particularly for additional space in the weekly newspapers. The SIM may need to consider drawing up formal contracts with the various diffusion services that specify frequencies and space.

Where does the policy analysis function fit in a vertically integrated arrangement? What are the implications for coordination between user needs and data providers? The SIT and subsequently the SIM have benefitted from a consultative committee and various workshops and seminars aimed at discussing user needs. Private-sector participants (farmers and traders) in these fora are generally identified by field enumerators, supervisors from the central SIM office and various projects (ACDI and CESA-MSU). Institutional users often give feedback on the weekly and monthly bulletins. However, in this arrangement there does not appear to be any institutionalized forum or feedback for discussion between private-sector users and the SIM. Some informal feedback is obtained through SIM staff contact with private traders during field visits.

On average the field enumerators possess but a ninth grade education. If the

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<sup>57</sup> Actually there is a formal agreement (on paper) between the Ministries in charge of RTM and the SIM.



field enumerators are to act as a conduit for feedback from the users of information (the same people from whom they are collecting data), then they will require additional training in market dynamics. In fact, regular in-service-trainings for enumerators could potentially serve as a feedback forum. The trade-off is between, on the one hand, incurring greater training costs for enumerators, the organization of regular open seminars and workshops, and of sending out supervisory missions; and, on the other hand, the potential increased relevance of the information product and potentially greater demand for SIM services.

### **5.3.2 The Organization of the Production of Analytical Products**

For the current arrangement of the SIM, increasing or improving the capacity to provide in-depth analysis is a major challenge. As discussed above, timeliness is less of an issue with analytical products that are based on historical data. Nonetheless, credibility and accessibility remain critical attributes for the production of analytical products and thus implications for who should produce these products. Currently, the local staff of the SIM has limited capacity to engage in longer-term analysis. This section will examine various scenarios that could potentially increase the supply of analytical products.

#### **5.3.2.1 The SIM and the IER**

Envision a scenario in which the SIM specialized in data collection services, while IER (the Rural Economics Institute) specialized in generating and disseminating analytical products. As noted above, specialized structures can benefit from economies of scale. In addition, Masten (1991) argues that "similar" transactions tend to be

organized together. By limiting itself to data collection activities, the SIM would avoid spreading its scarce resources too thinly (which could potentially happen in the face of expanding demand in a vertically integrated structure), thus economizing on measurement and monitoring costs. The availability of specialized skills in one institution such as trained enumerators (at the SIM) and analysts (at IER) is another force driving specialization.

IER could benefit from this organizational arrangement by further developing its analytical capacity and from the SIM's experience in grain market data collection, as well as potentially benefit from the SIM's reputation for reliability. Thus, in short, if the comparative advantage and economies of size are available, then organizing the SIM's analytical function in a specialized structure would reduce the transaction costs associated with monitoring dissimilar activities (data collection versus analysis). However, the SIM does become open to some additional measurement problems - particularly, reliability, credibility and accessibility. In fact, the reputation of the SIM for quality could be tarnished by sloppy IER work (Williamson's externality principle). If the SIM "contracts" situation reports from IER, it becomes subject to potentially larger contract enforcement costs, which it would not incur if it performed analysis internally (assuming it could).

As an organization specialized in data collection of cereals market information, the SIM could simply supply (either by giving or selling) this information to any organization wishing to engage in longer-term analysis. In this way the SIM's reputation would be less subject to potential sloppy and unreliable work.<sup>58</sup>

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<sup>58</sup> However, once the SIM is cut off from analysis, the risk of collecting irrelevant data is greater and thus more effort would have to go into coordinating user needs with data collection.

### **5.3.2.2 Cooperative Agreements**

It has been suggested that the SIM could organize its analysis function by entering into cooperative agreements with the schools of higher learning or IER. This section explores the trade-offs of the SIM entering into a cooperative agreement with, for example, IER or ENA. The issue that most readily comes to mind is the problem of coordination and management. If a contract (cooperative agreement) were rewarded to ENA, who would be in charge of the research funds? In the face of changing institutional foundations, what are the incentives against opportunism? In the current Malian environment, organizing the SIM in this fashion would undoubtedly increase the costs of monitoring and enforcement. In addition, it is quite feasible that measurement costs might increase in terms of product quality. Does ENA have the capacity to perform in-depth analysis? The SIM's most valuable asset is its reputation for reliability and timeliness. Will this arrangement compromise the SIM's reputation or subject SIM to "hold-ups"?

On the other hand, such an arrangement could foster the development of local analytical capacity. Statutes could be created that would allow research monies to enter these structures of higher learning, and ENA, IPR, and ENSUP could compete for research contracts much like universities do in the U.S.. This could potentially provide greater incentives to do exceptional studies, while simultaneously promoting the development of analytical skills in local students and safeguarding against the hazards of opportunism (Williamson 1985).

The rationale underlying cooperative arrangements is that both parties share the risks and the benefits of the research. In spite of the potential initial increase in transaction costs associated with a cooperative agreement arrangement, ENA would

benefit from research funds and the opportunity to develop its analytical capacity, and thus it would likely work hard to maintain the arrangement.

In addition to the analytical products produced by SIM staff, it is envisioned that analytical products would often be ordered by a special clientele (e.g., institutional or large-commercial traders) who likely possess a greater willingness to pay for the analytical product. For example, a public sector institution desiring to know the historical pattern of grain demand in a particular market as well as a forecast of potential demand could order the study from, for instance, IER. The transaction costs incurred, in this case, monitoring and enforcement costs, would be related to the final product.<sup>59</sup> Did the buyer receive what she ordered? Is it a credible product? What recourse does the buyer have if the product quality is poor?

### **5.3.3 The Organization of the Production of Credit Reports**

Lack of information about an unknown trading partner's behavior in exchanges is a potential impediment to trade. As transacting domains expand into distant markets, the feasibility of relying on traditional credit and enforcement systems breaks down. For instance, how can a trader be sure that if he extends credit to a distant trading partner that the trader will honor his credit obligation? What recourse does the trader have if payment is not received? A system that diffuses information about the behavior of potential trading partners can facilitate market integration. Credit reports are such an instrument. The most salient properties of a credit report are that it be credible and

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<sup>59</sup> Monitoring product quality in cooperative agreements is a major issue, especially when for example, the IER researcher faces an academic incentive and reward structure. For example, in the U.S. model, USAID often complains about universities taking money for work on practical problems and then producing academic tomes.

accessible to those who need it. Timeliness is important, although not as critical as for market news. Currently credit reports are not disseminated on any formal scale in Mali. However, within the trading community, there does exist an area-specific, informal credit reporting network that appears to be very effective, particularly in small trading communities. For example, a civil servant in a town may purchase grain on credit from a local trader, who maintains payment records (either on paper or in his head). If payment is not received, this will effectively restrict the civil servant's ability to receive credit again. In fact, often the entire town will know that the civil servant failed to pay, which could preclude him from receiving additional credit terms in that area.

#### **5.3.3.1 Private Sector Provision**

Private sector provision of these credit reports is organized in a vertically integrated system. The trader collects and processes the credit information about clients in his area, and dissemination is generally achieved via word of mouth. From the providers' perspective, the transaction costs associated with this arrangement appear to be very low. This system appears adequate for local trade but encounters problems when trade expands into new areas (e.g., long-distance trade) where the trader is dealing with unfamiliar clientele.

Could spot market exchange be a feasible organizational alternative for providing credit reporting services? By definition, spot market exchanges are one-time deals, where once the transaction is consummated, the transactors have few on-going obligations. A service, however, implies an on-going commitment. The credit data bank will need to be continually updated, and traders will unlikely supply their credit information to just anybody. And as indicated above, the spot market as an

organizational arrangement suffers from high transaction cost uncertainty associated with product quality and availability.

It appears that the collection of credit information by traders is done on an individual basis, and thus the traders only have access to information about their own clientele. In LDCs, trade associations often play the role of credit guarantor; however, economies of scale in the collection and dissemination of credit information could also be achieved via collective action. Group theory maintains that self-interest dictates that a group would voluntarily organize to produce a public good, as long as the individual members receive benefits from the public good in excess of his or her share of the costs (Olson's group theory as cited in Riemenschneider 1979, p.20). This would give the traders in the association broader access to credit information at a lower cost. As indicated above, the medieval European Law Merchant is an example of how this might work.

Milgrom et al. (1990) analyze how the Law Merchant - a private code of laws administered by private judges in medieval Europe - lowered costs of information about potential trading partners and provided for the enforcement of agreements across space and time. This system of private judges accomplished its objectives by bundling services (centralized information and enforcement via reputation) which were valuable to the individual trader with services that were valuable to the trading community. It enforced commercial law and encouraged merchants to behave honestly. Specifically, it imposed sanctions on violators, encouraged traders to become more informed about each other's trading behavior, provided evidence against violators of the code, and encouraged them to pay judgements assessed against them. It operated by traders querying (for a fee) the judges about a trader's past behavior.

For such a system to work, the judgements (i.e., fines) had to be reasonable enough for violators to pay, and the cost of making queries had to be low enough for traders to pay. If the costs were too high traders would not make claims or pay judgements. The threat of making a claim had to be **credible** (North and Weingast 1989). The system essentially worked on reputation mechanisms which depended on informing each other about past trading behavior. The idea was that well-informed traders could boycott those traders who violated trading codes, if they knew who the violators were. The system of private judges was designed to promote private resolution of disputes and transmit just enough information to the right people in the right circumstances to enable the reputation mechanism to work effectively. Milgrom et al. emphasize that for such a reputation system to capture scale and scope economies, there had to be a sufficient number of traders. An interesting avenue for future research would be to examine whether such a system could be made to work in Mali. Are there enough traders for such a system to operate efficiently and what similar methods for ostracism could potentially serve as a reputation system?

#### **5.3.3.2 Public Sector Provision**

Traders would be the primary immediate beneficiaries of credit reporting services. Public provision of these services would depend on the policy environment. That is, do the decision-makers support commercial traders? It is well known that in many countries traders are traditionally thought to be exploitative, and thus policy directives were aimed at reducing (not facilitating) their economic power. However, because of liberalization, efforts to facilitate the emergence and sustainability of a dynamic commercial sector have increased. Nonetheless, the main issue is one of trust

in the public agents collecting and disseminating credit information. Similar to a private trade association, public agents would have to collect the credit information from the traders and compile a credit data bank. Although for a good cause, the traders - who were previously thought to be exploitative - may be unwilling to release their credit records to government employees, particularly in the case of changing tax laws. The ex post cost of monitoring may be higher in this public arrangement relative to private-sector provision because the traders may incur extra cost trying to verify the source.

Similarly, how would dissemination be achieved? Would the traders purchase from the public sector credit reports compiled from information the traders themselves provided (and undoubtedly still have on record)? Dissemination via radio broadcast may be unethical and socially unacceptable. In any case, a public MIS, even if it doesn't directly produce credit reports can, by reducing risk in the trade, make the provision of credit information a less important problem.

#### **5.4 Summary and Conclusions**

This chapter provided examples of how a transaction-cost framework can be applied to analyze organizational questions regarding the SIM. In the context of assigning the production of information services and products to alternative organizational arrangements, the attributes of the organization (e.g., unbiased and experienced) should be discriminately matched with the characteristics of a successful information system in such a way as to maximize the provision of reliable, objective, accessible and timely information products.



## **CHAPTER 6**

### **CONCLUSIONS AND IMPLICATIONS FOR THE DESIGN AND EVOLUTION OF MISs**

#### **6. Introduction**

This final chapter summarizes the study and draws conclusions and discusses policy implications. It is organized in three sections. The first section summarizes the principal findings of the study, while the following section examines the utility and limitations of the framework. The final section discusses implications for the design and evolution of market information systems.

##### **6.1 Summary Comments**

In dynamic economies, market information systems are not only requisite but must also evolve to keep pace with the changing structure of the economy and the evolving needs of economic agents. Reform policies like liberalization of the grain trade in Mali increased the demand from both the private and public sector for reliable and timely dissemination of information and analytical products. However, the current organizational arrangement of the Malian grain market information system, the SIM, is subject to high measurement, monitoring and enforcement costs. Thus, internal and external forces (including the high transaction costs of the existing arrangement) pressure the existing organizational arrangement to adjust. In this sense, organizational form becomes endogenous. Consequently, MISs need a framework to analyze trade-offs among the various ways to continually restructure themselves. Towards this end, this study attempted to add an organizational dimension to the existing body of literature on market information systems. Coase (1937) and Williamson (1985) assert that organizational alternatives have transaction-costs roots. Thus, using transaction-costs

economics this study develops a transaction cost (TC) framework for analyzing alternative arrangements.

The development of such a framework highlighted:

- \* important theoretical and conceptual issues that influence the organization of an MIS;
- \* the components of an MIS;
- \* MIS design guidelines;
- \* critical parameters such as reliability and timeliness that influence the organization of the MIS;
- \* the existing organizational or contractual forms in the information subsector;
- \* the transaction costs (i.e., the trade-offs) associated with each organizational form.

The organizational form of an MIS is influenced by all of the above. Political, institutional and economic conditions also affect the organization of MISs. For instance, changing educational levels or economic conditions of traders may induce them to demand additional information products, again pressuring the existing organizational arrangement to adjust if the current form cannot meet the new demand. To avoid compromising the final product and hence the success of the system, when adjusting to meet new demands, certain performance guidelines must be considered. For instance, does the skill and motivation exist in the new arrangement? Is there a mechanism for feedback? Is the information product relevant to user needs? Related are what this study deems to be the most salient dimensions of the MIS product: reliability, accessibility, objectivity and timeliness. Any organizational arrangement that compromises these critical parameters will undoubtedly constrain the success of the MIS.

Similarly, the organizational form is influenced by the economic characteristics of information, especially its public good nature. This is important for determining who should or can supply information products at socially optimum levels. For example, fundamental market information is likely best provided (supported) by the public sector while some analytical products may be best produced by the private sector. Conceptually, designers of MISs should be aware of the various functions (data collection, analysis, etc.,) and relevant concerns associated with each component. Finally, designers need to know what the available alternative contractual forms are as well as have an understanding of the current organizations involved in the information subsector. This is particularly important for LDCs, where scant financial and intellectual resources make it necessary to mobilize, indeed capitalize on, existing local experience.

## **6.2 Utility and Applicability of TC Framework**

For this study it was very important to understand the lessons learned from other country experiences with market information systems because the trade-offs of reliability, accessibility, objectivity and timeliness could only be identified as real costs by examining empirical evidence. Therefore, the framework gains utility in that it is based on real, not theoretical concerns. Translating the trade-offs associated with alternative organizational forms into transaction costs not only facilitates comparison among the alternatives, but also establishes a framework for economizing trade-offs.

In terms of applicability, the TC framework was applied to various organizational scenarios in the Malian context. The conclusiveness of the analyses really depends on understanding the strengths and limitations of each of the players in the subsector. Due to lack of information, the descriptions of the organizations currently involved in the

information subsector are very brief and general in nature. A more thorough examination would increase the applicability of the framework. Nonetheless, this framework provides general guidelines for identifying the important issues to consider when re-organizing or further developing market information systems. Alternative courses of action can be evaluated based on this qualitative framework and the "best" arrangement can be identified. Moreover, it is easily transferable outside of the Malian context. The TC framework is an important first step towards recognizing organizational and institutional dynamics. This is particularly significant in the current Malian context where political and economic institutions are rapidly evolving.

The development of a TC framework included looking at the MIS in the context of a subsector. This was useful in that it highlighted user needs in terms of the information product desired and followed the production of the product through a vertical chain of alternative contractual forms.

### **6.3 Limitations of the TC Framework**

This paper attempted to establish a framework for analyzing the trade-offs of market information systems in LDCs and not necessarily the organization of general statistical services. Many of the issues are similar; however, the attributes of the final information product are quite different. Specifically, market information systems focus more on current or short-term information needs of economic actors, while statistical services tend to focus more on the long-term information needs of the public sector.

To identify better the trade-offs, this study would have benefitted from a thorough study of the organizations involved in the information subsector. The dynamism of the Malian political economy made it difficult to obtain current portraits of

these organizations; indeed, institutions and organizational mandates were changing during the writing of this document. This very dynamism has an impact on the effectiveness of the organizational arrangement of the SIM. The potential privatization of the national radio and television station (RTM) is one example.

Moreover, the literature on market information systems from which the design guidelines were derived is dated and very fragmented. The factors identified here which facilitate or constrain the success of an MIS depend, *inter alia*, on the level and stage of development (e.g., educational and economic). The factors illustrated in this study were found to be the most common for LDCs.

This is a first attempt to develop such a framework for analyzing the trade-offs of alternative organizational arrangements of MISs; thus, there are no other studies with which to compare our results. Indeed, even the theory underlying transaction cost economics is being redefined and extended. Moreover, as the TC framework is obviously a qualitative tool, further research could examine the possibility of adding quantitative tools to measure or rank-order alternatives by assigning values to the trade-offs in terms of the potential impact on the final product. The analyses of the preceding chapters illustrate how such a framework could be developed and applied.

#### **6.4 Implications for the Design and Evolution of an MIS**

Evolution is a consistent story of incremental change to be realized by productivity-raising organizational and institutional changes (North and Weingast 1989). The successful evolution of the organizational form of the SIM depends on careful planning and understanding of the current and evolving marketing system. Attention must be paid to not only the initial design (organizational arrangement) of the MIS, but

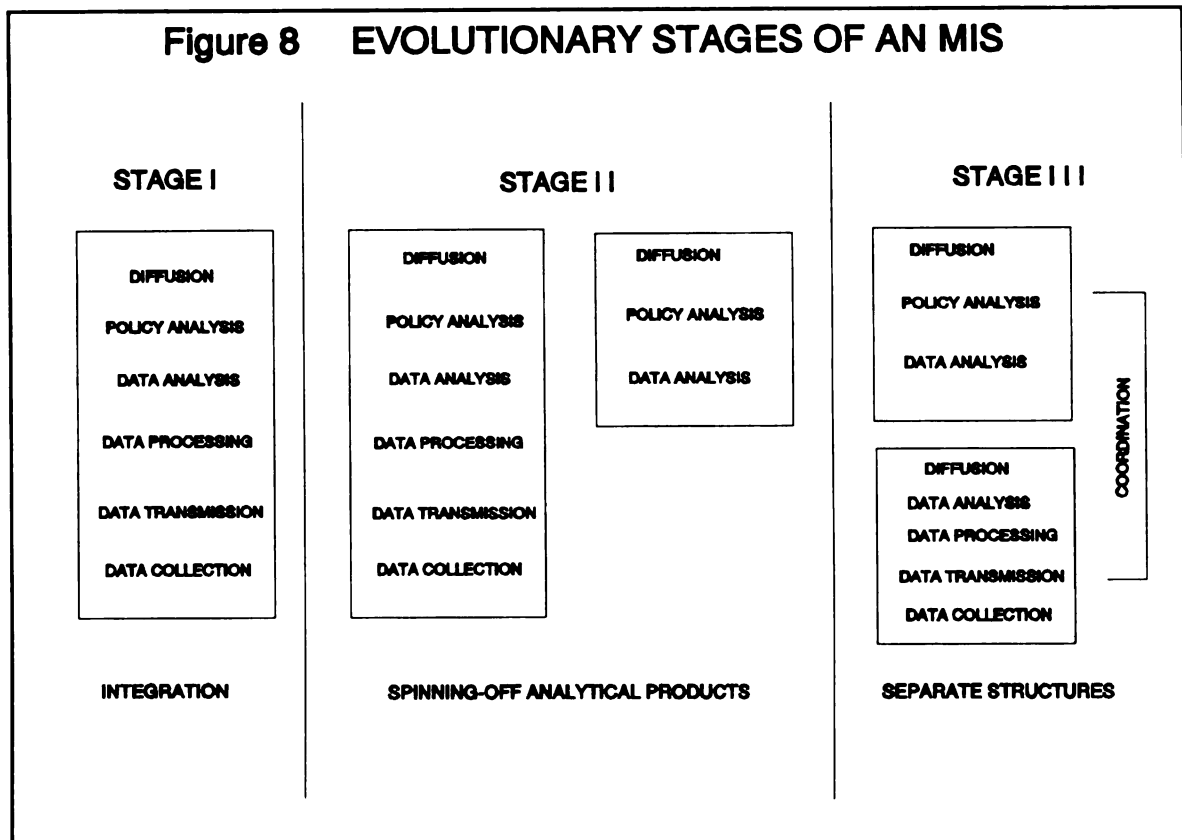
also to its evolution.

Experience suggests that the initial design of an MIS should be an integrated structure where all the MIS functions (collection, transmission, processing, diffusion, etc.,) are performed or controlled by one institution. This is particularly important for countries with limited financial and technical resources, implying that the skills and resources required to run a smooth-functioning MIS are less likely to be available in several institutions. Moreover, in the early stages of an MIS, it is critical that the system build a strong reputation for reliability and timeliness. In Chapter 5 we saw that the management in a vertically integrated structure has greater control over product reliability (reputation specificity) and timeliness (temporal specificity). Technical assistance and staff training (technical and managerial) play critical roles in the early stages of the development of an MIS, and substantial scale economies can be realized when training resources are organizationally concentrated. It is also easier to iron out problems in a single institution. The MIS can be integrated vertically or contractually. However, in the developmental stages, due to the greater control realized in a vertically integrated structure, all the functions that can feasibly (cost effectively) be performed by one organization should be, as this allows the staff to build sufficient experience and skill in all functional areas of the MIS.

It is easy to recognize the benefits of an integrated arrangement in the early stages of an MIS. However, when do the costs of this initial design exceed the benefits? As MISs mature, when should (assuming it should) the organizational form evolve from an integrated structure towards greater specialization. The Malian economy is rapidly changing, and as Hayek (1945) wisely observed, the organization of institutions that govern economic activity must also change. With many of the staff in the training stages,

the SIM is still in the developmental and "de-bugging" phase; however, the demand for additional market news and analytical products is increasing. Given that scenario, the SIM needs to move forward into the next stage of its evolutionary process. Stage two involves occasionally spinning-off certain activities such as the production of specific analytical products to other organizations, while the primary responsibility rests with the SIM. (See figure 8.) This model allows the SIM to refine its current activities such as data collection methods and data transmission while simultaneously meeting the needs of its clients for analytical products. Once streamlined, the SIM staff will continue to do in-depth analysis. Due to the importance of reliability, credibility and timeliness of the market "news" product, emphasis should be put on the SIM retaining activities related to data collection, transmission and diffusion. This is to avoid losing the reputation that the SIM has worked hard to establish.

Stage three involves separating the collection and diffusion of fundamental market news variables in one institution and the production and diffusion of analytical products in another. Economies from this stage are realized when the demand for analytical products reaches a level where the SIM and its occasional partners can no longer feasibly meet the demand. Or analogously, it occurs when the demand for market statistics reaches a level that requires that all of SIM's resources (to avoid compromising the reliability of the product) be devoted to the production and diffusion of market statistics. Lessons learned from the U.S. model suggests that a feedback mechanism between the data collectors and the analysts be institutionalized so that the statisticians and analysts avoid working in isolation, with the result that the information product remains relevant to user needs. Thus, even in stage three SIM has to do some data analyses to ensure that its data are relevant and reasonable.



An additional organizational alternative for dealing with increasing demand for MIS products is to decentralize the system. For example, in Brazil, data collection, processing, analysis and dissemination are managed and controlled by vertically integrated MISs at the regional levels. That is, each region operates an MIS that covers the crops and markets relevant to the economic agents in that region. Once disseminated to the local users (and others), the market information collected and processed at each regional level can routinely be sent to a central office for compiling national market statistics. In conclusion, when planning for the evolution of an MIS, the most essential element is to realize that the MIS must evolve to keep pace with user needs. If this is recognized in the initial design phase, then complementary institutions, such as IER in the Malian case, can be involved with the implementation and evolution



of the SIM from the beginning.

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