

CHAPTER 1 INTRODUCTION

1.1. Background

In Uganda, agriculture is the most important economic activity, providing income, employment and foreign exchange. The sector contributes 43 per cent of the gross domestic product (GDP) and 85 per cent of national export earnings. It also provides most of the raw materials for Ugandan industries (Ministry of Agriculture, Animal Industry and Fisheries [MAAIF] and Ministry of Finance, Economic Planning and Development [MFEPD], 2000). The agricultural sector is dominated by food crop production, contributing 71 per cent of the agricultural GDP. Only one third of the food crop produced is marketed, implying that the agricultural economy is still oriented towards subsistence production (MAAIF and MFEPD, 2000).

Much of the agricultural output comes from about three million smallholder farmers, who constitute three-quarters of the total farming population, but a large proportion of these people live under conditions of poverty. About 48 per cent of the rural population lives below the poverty line and 25 per cent cannot even meet their daily food requirements (MAAIF and MFEPD, 2000). Given that about 85 per cent of the population live in rural areas and derive their livelihood primarily from agriculture, a strategy to develop agriculture as a stepping-stone for poverty reduction in rural areas is realistic.

Agricultural development is ranked high on the agenda for poverty alleviation in the country. High rates of inflation and political insecurity hampered growth in the agricultural sector during the 1970s and early 1980s. In 1987 the government launched an economic recovery programme based on decentralized decision-making. The aim of the decentralized policy was to introduce efficiency and effectiveness in the generation and management of resources and in the delivery of services (Decentralization Secretariat, 1994). Key policy constraints were removed, including the control of food and export crop marketing and pricing by the government and parastatal monopolies, which led to a shortage of foreign exchange.

As a result, the trends in the production and export of agricultural commodities have since been upwards. It is clear that the government's strategy regarding agriculture and poverty is based on continued growth in the share of farming production that is marketed (MAAIF and MFEPD, 2000).

While the country registered a considerable growth in the agricultural sector during the period 1992 to 2000 (UBOS, 2003a), there are still problems. For example, the recent national household survey conducted between 2002 and 2003 shows that there has been a reversal in the downward trend in rural poverty indicators over the past decade (Table 1). There may be a number of reasons behind this reversal in poverty reduction trends, but low agricultural productivity looms large amongst the possible explanations. As in many other Sub-Saharan African countries, agricultural productivity in Uganda has stagnated relative to population growth. After the economic liberalization in 1992, the positive growth registered in the agricultural sector during the period 1992 to 2000 was achieved through increases in the area under production rather than through a growth in agricultural productivity (MAAIF and MFEPD, 2000).

Table 1. "Head count" percentage of the Ugandan population living in households with a real private consumption per adult equivalent below the poverty line for their region

Region	1992	1997-98	1999-2000	2002-03
National Rural	59.7	48.7	37.4	41.7
Central	54.3	34.5	25.2	27.7
East	60.6	56.8	36.7	48.3
West	54.3	44.0	27.4	32.7
North	73.0	61.8	65.4	65.0

Source: UBOS (2003b)

Although there is still much scope for the expansion of acreage under cultivation in the country, land for agricultural development is becoming increasingly scarce in some areas. This is particularly true in the area around Lake Victoria, as well as in the

highlands of the southwest and in the Eastern regions, where population densities are high and the average landholding is about 0.5 hectare (Gold et al., 1999), compared to the national average of 2.2 hectares (MAAIF and MFEPD, 2000). The highlands are the country's most fertile areas, but they are also more vulnerable to land degradation due to high population pressure and high altitude in some places, thus underscoring the importance of introducing land-saving technologies. Even those who attribute the positive supply response in the agricultural sector to liberalization are pessimistic regarding the scope for further supply increases. For example, Dijkstra and Van Donge (2001) argue that the supply response to liberalization could have run its course and that further growth in the agricultural sector will require investment.

Low productivity in the Ugandan agricultural sector is generally due to a number of direct and indirect factors. Direct factors include soil fertility decline and the increased incidence and intensity of pests and diseases. Indirect factors include: imperfections in both product and factor markets associated with high transaction costs, price risks and the use of low-yielding varieties or inputs (MAAIF and MFEPD, 2000). Furthermore, adoption rates are low for the agricultural technologies that have been developed to mitigate the negative effects of these constraints. The current adoption rate of new technologies in the agricultural sector is estimated at about 30 percent (MAAIF and MFEPD, 2000), thus underlining the need for a better understanding of the adoption process and constraints in order to guide policymakers in designing appropriate policies to stimulate adoption. Increased adoption of improved technologies in the agricultural sector is crucial for accelerating agricultural productivity and hence poverty alleviation in the country.

1.2. Statement of the research problem

Understanding the determinants of technology adoption has long preoccupied economists concerned with the crop productivity potential in developing economies (Feder et al., 1985; Feder and Umali, 1993). The effect of both the endogenous (i.e. human capital, attitudes towards risk and uncertainty or access to financial capital) factors and the exogenous factors (i.e. agro-ecological factors or market constraints) on the adoption process has been examined. However, most of the earlier adoption studies were conducted on the green revolution technologies (i.e. improved seed and

complementary inputs such as fertilizers, pesticides and mechanization) that were basically high external input technologies, introduced into the communities from external sources. After the green revolution, other than the continued releases of high-yielding varieties, many of the crop management technologies recommended for small farmers in developing economies have entailed relatively low levels of external inputs. There are a number of reasons for the growing interest in these technologies, among which is their affordability to poor farmers and their environmentally non-degrading nature (Lee, 2005).

Low external input technologies for crop management have features that distinguish them from the green revolution technologies. Specifically, the improved banana production management technology disseminated to banana producers in Uganda differs from the green revolution technologies in two important ways. Instead of being introduced in tangible form as a physical package of seed and other complementary inputs such as fertilizer, the improved banana production management technology is disseminated in the form of knowledge and the physical technology is made on the farm, using primarily local resources. As such, the improved banana production management technology is not only knowledge-intensive but also demands more of the farmer's resources such as labour, land and skills. These factors may cause the pattern of adoption to differ from that of green revolution technologies.

Modelling efforts have been made in the past to explain time lags in the adoption and partial adoption of technologies. A major emphasis in the modelling of adoption behaviour was the role of risk and profitability. Information was identified as an important variable that interacts with the endogenous variables (risk preferences and skills) to influence adoption. Policies to promote the diffusion of technologies based on the results of previous research were biased towards top-down approaches, reflecting the supply-driven, commodity focus of national agricultural research systems and the international centres.

Although it was recognized that information is diffused from early adopters to non-adopters (Kislev and Shchori-Bachrach, 1973; Hiebert, 1974), factors that intervene in the information diffusion process remained largely unknown in the economics literature of technology adoption. In particular, the role of social capital in technology

adoption, which may vary across locations or among farmers within the same location (Alesina and La Ferrara, 2000; Putnam, 1993), has received limited attention in the economics literature despite having long been recognized as an important factor in rural sociological work.

Recent attempts by economists to include sociological considerations in the adoption process have mainly stressed the possibility of late adopters copying or imitating early adopters to illustrate the problem of free riding on the investment in information made by early adopters. The basic assumption underlying the classical studies of social learning was that the information generated by early adopters was freely available to the whole village and differences in individual social learning were attributed to endogenous factors (i.e. prior beliefs, risk or human capital), with less consideration being given to the exogenous factors, such as social interaction (e.g. Kislev and Shchori-Bachrach, 1973; Hiebert, 1974; Feder and O'Mara, 1982; Feder and Slade, 1984; Foster and Rosenzweig, 1995).

As the more recent literature demonstrates, information diffusion may be a function of social capital (Conley and Udry, 2001; Collier, 1998), suggesting the possibility of differences in access to information from early adopters by potential adopters that may lead to differences in adoption rates. Social capital may influence social learning and technology adoption in a number of ways. First, social capital reduces the cost of information acquisition since it can be acquired passively during social interactions or actively from people who already know each other. Second, social capital reduces the uncertainty about the reliability of information. Information is likely to be given a higher value if it comes from trusted people. Third, social capital facilitates a willingness and cooperation in sharing information, thereby revealing tacit information that would be difficult to exchange otherwise (Yli Renko et al., 2002). Social capital also reduces transaction costs in a range of markets (such as output, labour and credit) that are endemic in most developing economies (Fafchamps and Minten, 2001).

Despite its potential, little has been done to estimate the effect of social capital on technology adoption in developing countries. In the few attempts that have been made, the emphasis has been on social learning (Isham, 2000).

The possibility that social capital may influence technology adoption through other mechanisms, such as access to bilateral transfers that relax expenditure constraints, has not been fully explored.

Finally, if social capital is important in adoption decisions, then policy makers should be interested in factors that influence its formation. However, studies that have examined the effect of social capital on technology adoption rarely go beyond its impact to analyse its determinants in rural areas. Yet, information on what influences social interaction in rural areas is important, given that the farmer-to-farmer model is increasingly being used as an alternative to the traditional extension model. The traditional extension model has recently been criticized for its failure to improve the productivity of low-input agriculture in developing economies (Carney, 1998; Rivera and Zijp, 2002). Uganda is pursuing a general policy of agricultural extension that diverges from the traditional extension approach in favour of farmer-to-farmer approaches (MAAIF and MFEPD, 2000). Hence information regarding the factors that influence social interaction in rural areas is of critical importance.

1.3. Objectives of the study

The general objective of this study is to examine the nature of the relationship between social capital and the use of improved banana management practices (i.e. mulching, manure application and sanitation) in Uganda.

Specific objectives are to:

- a) conceptualise, define and measure social capital;
- b) identify the determinants of social capital;
- c) analyse the decision-making processes of banana farmers in the adoption of improved banana management technology; and
- d) determine the effect of social capital and other factors on the use of improved banana production management practices (i.e. mulching, manure application and sanitation practices).

1.4. Hypotheses

Social capital in the form of social networks provides various services to individuals in developing economies. These services could link social capital to the choice and extent of use of a crop management technology through different mechanisms. Some of these mechanisms may be complementary while others are independent or offsetting. At least three services provided by social networks that may interact with a household's technology adoption decisions can be distinguished. These are: (1) a social learning environment; (2) bilateral transfers that may relax the household's credit or risk tolerance constraints; and (3) facilitation of collective action where coordination is needed due to technological externalities. Since no substantial technological externalities are involved in the adoption of banana production management practices, the present study focuses on the first two.

Social capital, social learning effects and technology adoption

In many developing economies, informal information dissemination mechanisms remain the only available source of information for many farmers. Farmers can passively or actively seek information from their neighbours or observe their neighbours' experiments (Foster and Rosenzweig, 1995; Collier, 1998) during social interactions. Since information may come in the form of an externality, social capital reduces the cost of information accumulation and enables farmers to adopt new farming practices. The following testable hypotheses can be derived.

Hypothesis 1: Households with a higher participation in social networks have better access to information and are more likely to use improved banana production management practices. Network effects can also come in the form of conformity pressure exerted on farmers to adopt by their peers who have adopted (Moser and Barrett, 2003). Conformity effects and social learning effects are not mutually exclusive, but may represent effects that complement and reinforce each other. Disentangling these effects would be a worthwhile exercise but limitations in the data available are a constraint on such estimation in the present study.

Hypothesis 2: Social networks with leaders who are better educated and of higher livelihood status than most members promote social learning and technology

adoption. Because the wealthier and better-educated farmers are more likely to mobilize and exploit the strength of the weaker ties (Rogers, 1995; Granovetter, 1973; Broeck, 2004), they serve as a link between their social network members and the external sources of information.

Hypothesis 3: Social networks with participatory norms of decision making encourage cooperation among members that in turn facilitates information sharing and exchange and hence technology adoption.

Social capital, bilateral transfers and technology adoption

Social capital may facilitate bilateral transfers that could influence crop management decisions. As noted by Fafchamps and Lund (2003), social capital facilitates gift transfers and informal borrowing either because altruism must be nurtured by intimate personal contacts or because trust is required for the promise of reciprocity to be credible. Bilateral transfers may also work through different mechanisms that can be complementary or contradictory. Second, access to a social network that can help in times of crisis may reduce risk-aversion (Fafchamps and Lund, 2003) and enable the individual to experiment with new technologies. When markets are distorted, better access to assistance, whether in kind or informal credit, complements the households' family resources, which may increase economic freedom while making production decisions. Based on this discussion, the following hypothesis can be derived:

Hypothesis 4: Social capital promotes access to bilateral transfers, which in turn increases economic flexibility and willingness to use improved banana management practices. However, if the primary purpose of bilateral transfers is to smoothen consumption after a shock, it is likely that such transfers will be used for immediate consumption rather than investment (Fafchamp and Lund, 2003), and the effect could be ambiguous.

Social capital is one of the possible factors that influence adoption decisions. The hypothesized effects of other factors that are likely to influence the use of improved banana production management practices are discussed in Chapter 7.

Determinants of social capital

Social capital is not uniformly distributed across locations (Putnam, 1993; Knack and Keefer, 1997). Some communities have more social capital than others, even within the same location, and some households have more social capital than others. The heterogeneity in the distribution of social capital among rural households may originate from two sources: differences in investment in social interactions, as well as differences in the endowments of social capital in the communities where they live (Alesina and La Ferrara, 2000; La Ferrara, 2002). The following hypothesis is derived:

Hypothesis 5: There is a positive relationship between the ownership of other types of capital (such as physical and human capital) and investment in social capital.

1.5. Organization of the dissertation

The next chapter provides a brief overview of banana production and its economic importance in Uganda and describes the characteristics of the crop management technology. Recommended production technologies are described with special mention of relevant production constraints targeted by the improved technology. The intention is to highlight the practical problems of banana production and link them with the conceptual approach of this dissertation.

Chapter 3 presents a review of the theoretical and empirical literature on the adoption and diffusion of crop innovations, differentiating seed-based innovations from those related to mulching, manure application and crop sanitation for a perennial crop. The role of information and economic constraints in explaining adoption behaviour is discussed and empirical factors that influence access to information are reviewed. The chapter also highlights the key features of an agricultural household model.

Chapter 4 presents the general overview of the literature on social capital, focusing on its meaning, forms and determinants. Drawing from this literature, a definition of social capital used in the present study is presented. Important mechanisms through

which social capital may influence the adoption of technologies such as those studied in this dissertation are identified.

Chapter 5 presents the conceptual framework for analysing the adoption decision-making processes of banana farmers regarding technology adoption and a model of technology choice. In the model social capital is incorporated as a component of exogenous income and the process of accumulating information.

Chapter 6 describes the data sources and sample characteristics. The chapter presents a summary of the methods used for the sample domain stratification and provides an overview of the domain, as well as the stratifying criteria and procedures used for data collection. A summary of the survey instruments is also presented.

Chapter 7 establishes the link between the empirical estimation and theoretical analysis developed in Chapter 5. The econometric models used to test the hypotheses are described. The chapter also defines the variables used in the empirical estimation. Some of the methodological issues inherent in using cross-sectional data to analyse technology adoption are discussed and reduced-form models for household participation in associations and private networks in rural areas of Uganda are presented.

Chapter 8 presents the descriptive statistics on the use of improved management practices and social capital. The rates and extent of adoption are compared using elevation, exposure, market access and farm holding as the stratifying variables. Descriptions of the local social structures, participation in associations, associational characteristics and household private social networks are compared across regions and infrastructure development.

Chapter 9 presents and discusses the results of the impact of social capital and other factors that significantly affect the adoption of the practices of mulching, manure application and sanitation in banana production. The empirical results of the factors that influence the household's decision to participate in local associations and private social networks are also presented and discussed in this chapter.

Finally, Chapter 10 presents a summary of the key findings from the research conclusions and outlines the implications for policy. Suggestions for further research are also presented.