CHAPTER 2
BANANA PRODUCTION AND ITS ECONOMIC IMPORTANCE IN UGANDA

This chapter provides a brief description of key features of banana production in Uganda and highlights the physical, market and social conditions under which the crop is produced. The economic importance of the banana crop is summarized. An overview of the banana production constraints, recommended crop management technologies and sources of information are presented.

2.1 The economic importance of bananas

Bananas are a major food staple of the country as well as a cash crop. The crop provides an estimated 30 per cent of the calories, ten per cent of the protein and five per cent of the fat intake of the population, representing 25 per cent of the total value of agricultural output (Kalyebara, 2002). The per capita annual consumption of bananas in Uganda is the highest in the world at approximately 0.70 kg per person per day (International Network for the Improvement of Banana and Plantain [INIBAP], 2000; National Agricultural Research Organization [NARO], 2001). Compared to other important crops in the country, banana occupies the biggest proportion of utilized agricultural land (about 1.4 million hectares or 38 per cent of the total utilized land), making it the most widely grown crop (Figure 1) and serves as one of the most important food security crops for central, western and eastern Uganda (NARO, 2001).

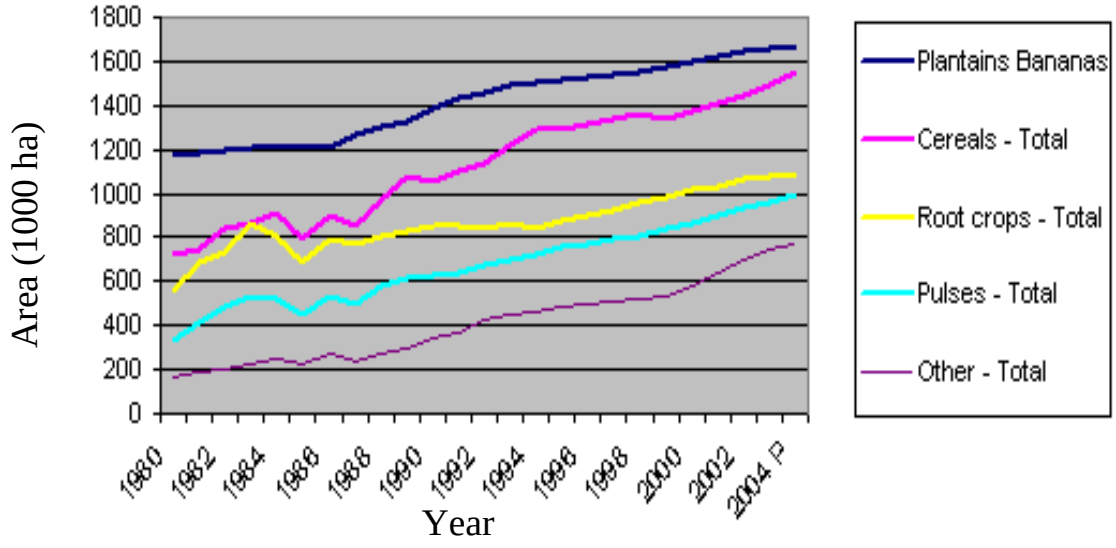

Figure 1. Area planted to major food crops in Uganda (1000 hectares) (MAAIF, 2004)

Uganda is the second largest producer of bananas in the world. In 2001, the annual output was estimated at 10.5 million metric tons, accounting for over 10 per cent of world output (FAO, 2001). However, the country is among the smallest exporters of bananas in the world. Most of its production is consumed nationally, with some regional trade and very small quantities exported to Europe. About 90 per cent of Uganda's banana output is marketed domestically (Mugisha and Ngambeki, 1994).

Although the export potential for bananas produced in Uganda appears to be limited (Tushemereirwe et al., 2003), the future prospects for local banana markets appear to be good. A major factor is the urban population boom, which has driven prices upward in the food markets of Kampala, the country's capital city, and other cities. The main constraint limiting the profitability of banana marketing stems from the high cost of transportation from major suppliers who are over 300 kilometres away from the major market (Kampala), and the risks involved. Transport costs account for 80 per cent of total marketing costs (NARO, 2005).

In Uganda, bananas can be used in many ways and forms. Bananas are eaten in both urban and rural areas as cooked food, juice or beer, as roasted or sweet snacks, or as dessert. The cooked food and juice also have cultural functions in some stages of the wedding and funeral rites. The different parts of the crop have different uses in the daily life of a farm household. The leaves are used in the steaming of food, sheaths are used to make ropes and crafts, and pseudo-stems provide fodder. The multiple uses of bananas in Uganda are derived from the country's great crop diversity. Uganda is the second greatest centre of banana diversity after East Asia (Edmeades et al., 2005).

In addition to their common use, banana varieties grown in Uganda are differentiated by the differences in their genome groups and observable characteristics. Edmeades et al. (2005) classify the bananas grown in Uganda as either endemic (or consistently present) in East Africa or non-endemic. The endemic banana varieties, including the AAA-EA genome group, consist of two use-determined types (i.e. cooking bananas

[*matooke*] and beer bananas [*mbidde*]) and account for about 85 per cent of all bananas grown in Uganda (NARO, 2001). The non-endemic bananas grown in Uganda are locally adapted, introduced banana varieties, which have their origins in South-East Asia, and a number of conventionally bred hybrids originating from the Honduras (Edmeades et al., 2005). Among the locally adapted, introduced varieties are exotic beer and sweet bananas (AB, ABB and AAA genome groups) and roasting bananas or plantains (AAB genome group).

According to Edmeades et al., (2005), the exact number of banana varieties in East Africa is still a subject of on-going debate among breeders. The East African highland bananas are locally identified by their local names, which vary from one location to another. The same name may be given to the same clone or a single clone may have different names in different parts of the country. Karamura and Karamura (1994) identified a total of 233 East African highland banana varieties (genome group AAA-EA), of which 145 are cooking bananas and 88 are beer bananas.

2.2. Banana production

The exact period when the banana crop was first introduced to Uganda is not known, but there are speculations that the crop may be as old as agriculture itself (McMaster, 1962). Since its introduction to the country, banana cultivation has steadily expanded in both acreage and popularity. For example, in 1958 the crop occupied a total area of about 485 800 hectares and supplied the main subsistence to 35 per cent of the total population (McMaster, 1962). In 2000, it was estimated that bananas occupied about 1 510 000 hectares of land (MAAIF and MFEPD, 2000), representing about 60 per cent expansion in about 40 years. At present, the crop is grown in almost every part of the country, though at varying intensities (Figure 2). Clearly visible patterns of banana growing can be observed from the south up and along the central part of Uganda (known as “the banana belt”).

Production is concentrated at altitudes between 900 and 1 800 metres above sea level (Davies, 1995). Permanent cultivation requires a minimum annual rainfall of 1 000 millimetres, which is distributed evenly throughout the year. A bimodal rainfall

characterizes Uganda, with peaks recorded during the months of April to May and October the November, making the country particularly suitable for banana growing.

An estimated 61 per cent of the national banana crop is produced in the western region of the country, 30 per cent is produced in the central region and the remainder in the eastern region (UBOS, 2002) and other parts. Most banana production takes place on small subsistence farms of less than 0.5 ha (Gold et al., 1998). The crop is mainly grown for home consumption and a contribution of 8 to 22 percent of rural revenue is realized (Ssennyonga et al., 1999).

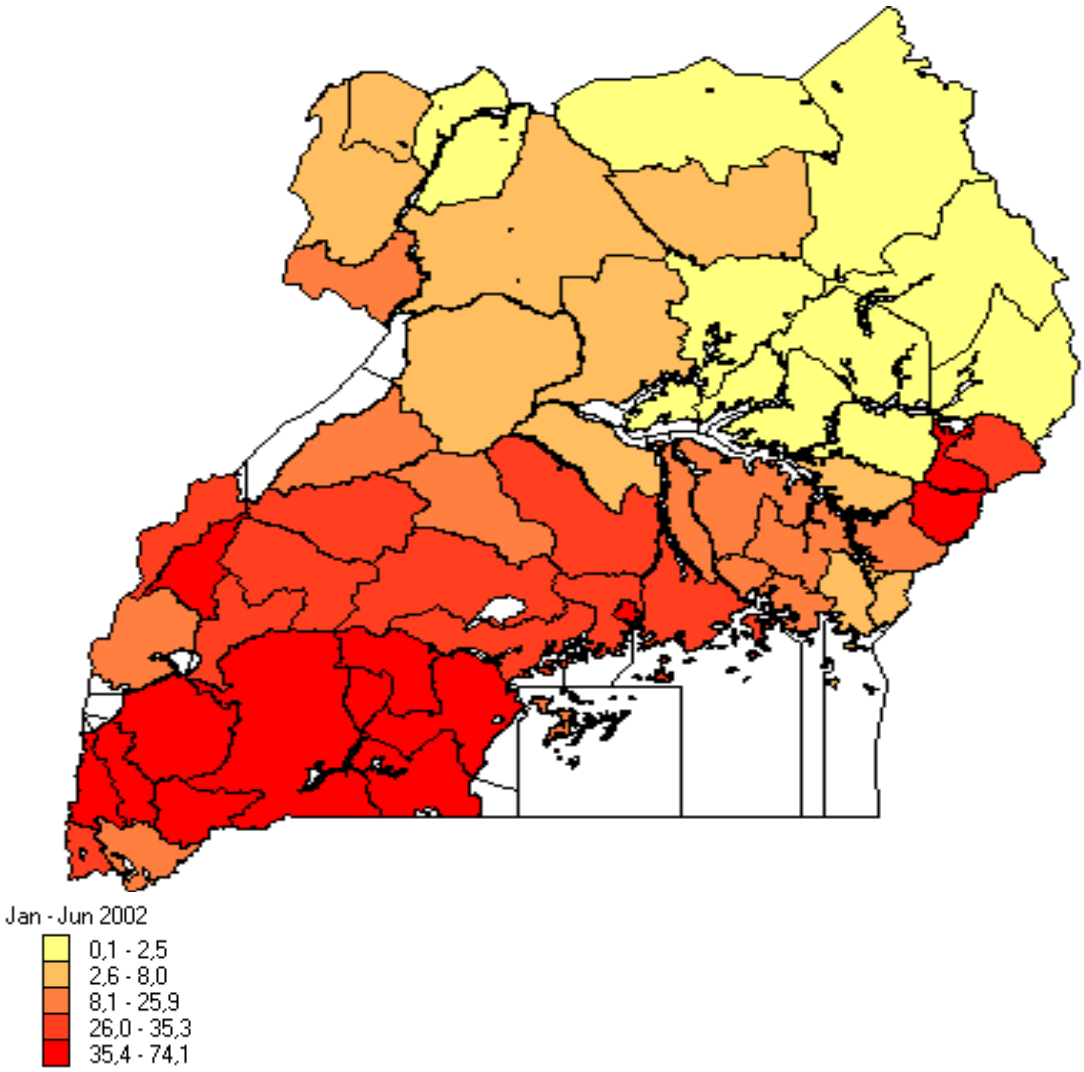

Figure 2. Proportion of agricultural households with banana plots in Uganda (UBOS, 2002)

The banana crop flowers all year round and it is potentially a high yielder, with an annual production equivalent to 8.5 metric tonnes. The crop is less affected by drought than annual crops. The average lifespan of banana plantations is around 14 years, with production peaking between the second and fourth year and gradually declining in subsequent years. The lifespan depends on agro-ecological conditions and management practices. The low-input cultivation of bananas under poor management and infertile soils can cause yields to decline after two years, while with good management practices high yields can be sustained for up to eight years (Robinson, 2000). The life span of banana plantations ranges from as low as four years in the central region to over 30 years in western Uganda (Speijer et al., 1999). Plantations that are over 50 years old exist in the southwestern region[1].

In the past few decades, bananas were a highly sustainable crop in Uganda, with a long plantation life and stable yields. Over the last 30 years banana production patterns have been changing, with acreage increasing or stable in most of the western region, while declining mostly in the Central and Eastern regions. The acreage shift has been attributed to the increasing severity of production constraints, particularly the declining soil fertility, pests and diseases that severely reduced production in some areas (Rubaihayo 1991; Gold et al., 1998). Soil fertility depletion is one of the underlying causes of low agricultural productivity in Sub-Saharan Africa (Sanchez et al., 1996).

Included among the most widespread pests and diseases are weevils, banana nematodes, Black Sigatoka disease, Panama disease or *Fusarium* wilt, and banana bacterial wilt (BBW), which cause significant yield reductions of up to 80 per cent. Weevils are insects that attack all types of banana varieties, although the intensity of weevil damage has been found to decrease with elevation (Gold et al., 1994). Nematodes are root pests that cause root necrosis that interferes with water and nutrient movement in the plant. Black Sigatoka is an airborne fungal disease, which affects the endemic banana varieties. Fusarium wilt is another fungal disease that attacks the roots of banana plants. The exotic brewing varieties are particularly susceptible to it (Gold et al., 1993). Bacterial wilt has emerged as a new and major

[1] The author's father is 70 years old and his current banana plantation was inherited from his father (the author's grandfather).

disease since 2001. Due to its severity, and the fact that presently there is no variety in Uganda that is resistant to the disease, it poses a major threat to banana production in the country.

Drastically declining yields in the historical production areas have led to the replacement of bananas with annual crops and the locus of banana production has shifted to the south-west where biotic pressures are less but the distances to urban markets are greater. Productivity in central Uganda is estimated at six tons/ha, while in the southwest it is 17 tons/ha, which is still low compared to the potential 60 tons/ha attainable at research stations (Tushemereirwe et al., 2001). Despite the decline in production, bananas are still the most preferred staple in many localities, where the word banana is used interchangeably with food, commanding a relatively high price in urban markets.

Available historical data reveal a sharp decline in both output and yields from 1970 to the early 1980s, followed by stagnating national yields (Figure 3). The decline in production in the 1970s and 1980s was largely due to a severe outbreak of banana weevils in the Central Region, then the locus of banana production. The increasing banana production between 1980 and 2003 is largely due to area expansion and the shift in production to the more productive regions in the West. However, banana yields have not recovered to pre-1980 levels, despite intensified efforts to improve productivity through R&D. Clearly, banana producers in Uganda still face major productivity constraints.

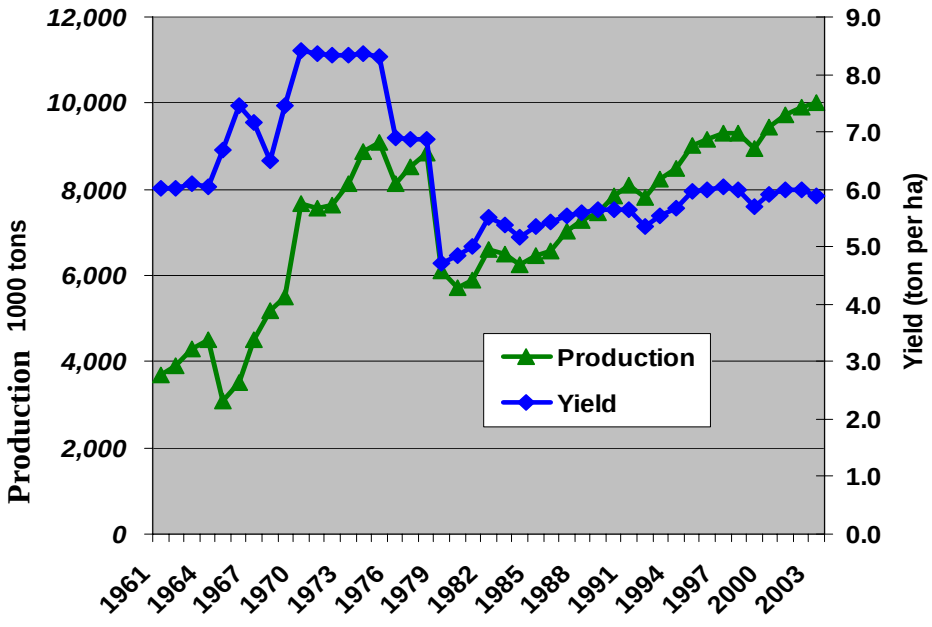

Figure 3. Trend in banana production from 1961 to 2003 (FAO, 2004)

2.3. Banana production management technology

Bananas produced by continuous propagation on the same piece of land demand intensive management to sustain their yield. Both the management of the natural resource base and that related to the crop itself are recommended. Natural resource management practices recommended for banana production include: mulching, manure application and the construction of bands along contours for soil and water conservation (SWC).

Mulching is done with dry organic materials that are spread between the banana mats to suppress weed growth, conserve soil moisture and add nutrients to the soil when the organic materials are decayed. Traditionally, banana plantations were mulched with banana residues (such as old pruned leaves and split pseudo-stems) to suppress weeds, but following the decline in soil fertility, other sources of mulch, including annual crop residues and grass were recommended. Crop residues such as maize stalks, bean trash and sorghum or millet stover are commonly used. In addition to mulching technology, farmers are advised to apply certain other fertilizers to supplement mulch in restoring the nutrients lost due to crop harvests[2]. Other organic fertilizers are applied directly to the soil as organic manure (i.e. animal waste and composted household refuse). Farmers make organic manure from organic materials locally available on the farm. Two types of organic manure are used: dry animal waste or composted crop residues. Composting techniques are less commonly used, perhaps because of their demand on labour or their complexity. Inorganic fertilizers

[2] Although banana residues are recycled, large quantities of nutrients go into the fruit, which are lost when the fruit is sold in urban centers. Even when consumed on the farm, the peels, which contain most of the nutrients, are often used as fodder for livestock (Tushemereirwe et al., 2003).

are also rarely used, perhaps due the to high transaction costs that limit their supply in rural areas (Young, 1994).

The addition of an adequate layer of mulch keeps the plantation surface cool for a long time after rains, which is not only good for the banana plant but also for the banana pests (i.e. banana weevils). Therefore, it is recommended that mulch be applied about 50 cm away from the banana mat (Tushemereirwe et al., 2003). Placing mulch or manure close to the base of the mat can also cause the plant roots to grow towards the surface, making the plant susceptible to wind damage.

Farmers are further advised to carry out a number of other crop management practices to ensure good sanitation in their plantations in order to reduce pest and disease infestation as well as contributing to the good management of their soil fertility. Sanitation practices (hereafter referred to as mat management technologies) include: "corm paring" (removal of the outer sheath from the corm of a sucker before planting it), de-trashing (removal of dry leaves and sheath), de-suckering (removal of excess plants on a mat) and a number of post-harvest residue management practices (stumping, corm removal, splitting or chopping pseudo-stems, and weevil trapping). As in the case of mulching and manure application, farmers must follow certain rules while implementing mat management technologies in order to ensure successful banana production. These rules are practice-specific, making the recommended technologies for improving banana management complex.

Corm paring is a new technique recommended for the control of banana weevils and nematodes. The work should be done in the field where the sucker was obtained to avoid transferring pests to a new field. Furthermore, washing the corm before corm paring is ideal for the effective control of the pests. De-trashing is a traditional technique, involving the removal of the old leaves and sheath. Although it is recommended that leaves should not be removed when still green because they are still useful to the plant, many farmers remove a few green leaves during de-trashing to avoid wind damage. De-trashing contributes to pest and disease control and also provides materials for recycling as mulch. This is done about two to three times a year during rainy seasons but farmers who follow the recommendations may repeat the practice more than three times a year.

De-suckering is also a traditional pre-harvest technology involving the reduction of the number of suckers on a banana mat to reduce competition for water, light and nutrients. With the increased incidence of biotic and abiotic factors, the technique has been modified to cope with the constraints. Farmers are now advised to leave only three plants per mat, with only one plant from each successive generation (commonly referred to as a family, consisting of a mother, one daughter and one granddaughter). Although the practice is widely used, there are notable variations in both the number of suckers left on a mat and the composition of plants on the mat.

Post-harvest mat management practices have also been modified to increase their efficacy in the management of pests/diseases and soil fertility. After harvesting, the stem is cut away at ground level and the stump is covered with a thin layer of soil to prevent invasion by and the breeding of banana weevil. This process is called stumping. The cut stem is split and spread between mats as mulch. There are typically three different methods of splitting the stem, which result in varying levels of effectiveness in pest and soil fertility management.

Given the increase in biotic and abiotic factors and consequent modifications in the banana management technologies, the efforts of banana researchers during the 1990s were directed towards the formulation of operational strategies to address pest/disease problems and create more awareness of the importance of fertility management among farmers. Both on-station and on-farm experiments with the different options were conducted to evaluate the available technology. Scientific experiments conducted on-farm in south-western Uganda indicate that the use of mulch and contour bands can increase banana yields by about 25 per cent, while the use of farm-yard manure can increase yields by about 35 per cent (Oketch et al., unpublished). This is consistent with the observations of other researchers that intensive application of organic fertilizers in the form of mulch (i.e. grass, crop residues or kitchen refuse) or animal manure (i.e. cattle, goat, pig and poultry manure) in banana plantations can improve and maintain soil fertility even when fertility is inherently low (Rubaihayo, 1991; Davies, 1995). These technologies have been disseminated to farmers in a number of different ways.

2.4. Dissemination of banana management practices

Three types of mechanisms have been used in the dissemination of recommended management practices in Ugandan villages: (1) formal sources (government extension services, NGOs, and on-farm research); (2) other farmers; and (3) mass media. The most common and widely used mechanism for information about recommended management practices, in all the production regions, is farmer-to-farmer dissemination (Table 2).

Over 90 per cent of the farmers surveyed reported that they had obtained information regarding banana management from other farmers, and nearly two-thirds were provided with information by formal sources, with 35 per cent receiving it exclusively from other farmers and 56 per cent from both farmers and formal sources. Among the formal sources, government extension was more frequently reported, perhaps due to the wider coverage and the length of time the government has been involved in dissemination. The dissemination of new agricultural technologies in Uganda was traditionally the role of the government extension service, which was joined by some NGOs in the 1990s as part of the economic recovery programme ushered in by President Museveni's government in 1986.

Table 2. Sources of information on banana management practices

Information sources	Percentage of farmers
Formal sources	61.26
• NGOs	22.91
• Government extension	42.76
• Researchers	9.89
Other farmers	90.49
Mass media	25.70
Radio	24.03
Publications	2.83

Source: Survey data, 2003-2004

On-farm research and mass media are relatively new mechanisms introduced especially in the Central region as a strategy to revive banana productivity. As expected, researchers are popular as a source of information in this region because on-

farm research intervention has been more concentrated here than in other regions. A quarter of all farmers reported receiving information through mass media. Radios are a frequent source of information in some areas, but publications are rarely used.

Although there is insufficient information to ascertain when most of the banana management practices were introduced to the country, a significant number of them are classified by farmers as ancestral, especially in the south-western and central parts of Uganda. Some of them may be as old as the crop, while others are likely to have arrived during colonial times as management practices for cash crops (such as coffee and cotton) and were later adopted for banana production. Interviews with farmers revealed that the dissemination and diffusion of banana management practices have not been uniform in all three of the production regions. Some practices that are classified as ancestral in one region are considered to have been introduced in another region (see Appendix A), which implies that there are weak interregional linkages.

2.5. Factors affecting banana production

There are direct and indirect factors that affect banana production in Uganda. The direct factors include those already mentioned: the high incidence and intensity of pests and diseases and the decline in soil fertility resulting from high population pressure. The indirect factors include socio-economic factors and the characteristics of the available crop management technologies. These indirect factors are discussed next.

2.5.1. Characteristics of improved banana management technology

As already mentioned in Chapter 1, the principal characteristic of the improved banana management practices is their dependency on farmer resources for implementation. The improved banana management technology typically requires better access to land, labour and management skills. The technology is land-saving on the one hand, and land-using on the other. For example, the use of manure and mulch in banana plantations can significantly increase land productivity (Oketch et

al., Unpublished; Rubaihayo, 1991; Davies, 1995) but also indirectly requires access to more land since the crop residues used to mulch or make manure must come from own on-farm production of annual crops (i.e. beans, millet, sorghum, maize) or from livestock, which in turn requires land.

According to Boserup (1965), increases in population pressure and the consequent decline in the land-labour ratio lead to the adoption of techniques of intensive agriculture. In the case of banana production in Uganda, the increase in population pressure has not been matched by increases in the use of techniques such as mulching and manuring, because these practices depend on land availability and household wealth (measured in terms of livestock capital). As the population pressure increases, materials to make mulch and/or manure become scarcer. Instead, more labour is used in controlling weeds, which could be reduced by good mulching. According to Davies (1995), weeding accounts for one-fourth to one-fifth of the time spent in the maintenance of banana plantations. The most noxious banana weeds in Uganda include *Digitaria Scalarum* (blue couch grass) and *Oxalis latifolium* rhizomes. The removal of these weeds requires considerable care to avoid damage to the root system (Rubaihayo, 1991) and is hence labour-intensive.

Another principal characteristic of the improved banana management technology is that it is labour-intensive, but labour availability represents a limiting factor (Ngeze, 1994; Davies, 1995). Although in high-altitude areas cool temperatures may facilitate prolonged working hours, this labour may not be available for banana production, as the time taken to reach the fields, as well as that needed for performing domestic activities (drawing water, collecting firewood), tends to increase with the slope and population density. In addition, the trend towards increased enrolment in schools changes family labour availability. Furthermore, the high number of management practices, and the rules and art of their implementation as described in section 2.3 and in Tushemereirwe et al. (2003), underline the complexity of these practices and the level of knowledge required in banana production management.

2.5.2. Socio-economic factors

Banana is a highly competitive crop in Uganda but its competitiveness depends on the level of management (Bagamba et al., 1999). Thus, factors that affect the choice of

management practices influence the returns from the crop. Good crop management indirectly affects crop productivity by reducing the negative effects of the biotic (weevils) and abiotic factors. Farmers' ability to respond to the different biotic and abiotic constraints by adopting good production management practices depends on a number of factors. Land pressure, low incomes, family labour endowment, gender imbalances in terms of access to resources, lack of adequate education and limited access to information regarding production are some of the constraints reported that limit the farmers' ability to effectively deal with the problem of low banana productivity (Bagamba et al., 1999).

Market distortions in both the output and input markets are endemic in Uganda's rural areas. The difference in access to banana markets and hence transaction costs across the major producing areas is evident. The Central Region has comparatively more urban centres, including the three major banana markets of Kampala, Jinja, and Entebbe (Mugisha and Ngambeki, 1994). Populations are also higher in the Central Region compared to the south-western and Eastern Regions. The buyers of bananas from the south-western region face relatively higher transaction costs due to having to travel long distances to the market, which is reflected in low farm-gate prices (Mugisha and Ngambeki, 1994). Therefore, although higher yields may outweigh the higher production costs in the south-western regions (Bagamba et al., 1999), the movement of commercial production to areas further from the principal markets in Central region may not be sustainable in the long run. The perishable nature of cooking bananas limits storage time and their bulkiness makes transportation and marketing very costly. In addition to this, overloading to reduce fixed costs and greater transit time lower the quality of the fruit (Gold et al., 2000). Access to different production zones with varying supply periods may prove important for the reduction of the seasonal fluctuations in banana production (and price) and the diversification of sources of supply (Lynam, 2000).

Increasing production in the Central Region would significantly reduce transaction costs in the marketing of bananas and the farm-gate share of the total price would then be able to increase. However, in addition to soil and biotic constraints, poor management of the crop in this region further limits productivity. Many farmers propagate their bananas using methods that have remained largely unchanged for

generations. They focus on weed control and de-trashing to maintain crop sanitation. Most of the practices recommended for banana management are used irregularly and sometimes not at all, which encourages bare soil between mats, where erosion starts too readily and where pests (e.g. weeds, weevils, nematodes, etc.) are allowed to take hold. The direct consequences are low yields and a reduction in the lifetime of the banana plantation.

Aside from physical factors, there are remarkable socio-economic differences across the banana producing regions that could explain the differences in crop production. These differences have not yet been studied. First, market access for banana in the Central Region also implies high market access for all other commodities, which may imply high opportunity costs for investment in banana relative to other crops. Edmeades et al. (2004) concluded that good market access is important to farmers in regard to their choosing which banana varieties to grow, but they did not examine the effect of market access on the use of crop management practices.

Differences are also apparent among the three regions in terms of social characteristics and, implicitly, social capital. These differences may influence the diffusion of information and the ability of households to overcome market constraints, with consequent implications for technology diffusion (Rogers, 1995; Isham, 2000). A high degree of social homogeneity, expressed in terms of domination by one ethnic group[3] and religious affiliation is apparent in high elevation areas (Table 3). Only four out of 20 villages surveyed had less than 50 per cent of households from a single ethnic group, and all were found in the lowlands. According to key informants, the cultural homogeneity in the lowland villages was affected by the importation of labour from other regions to work in commercial crops (coffee, cotton), sugar factories or railway construction during the colonial period.

[3] The concept of an ethnic group cuts across various forms of social organization, including tribe and kingdom, but conveys more of a shared sense of territory and a link to an ecology or food culture than does the term “language group.” Some ethnic groups have lost the use of their language and still remain distinct ethnic groups with a unique ecology and food culture. The term “ethnic group” has no colonial connotations and represents a level of institutions and social organization within and at times across the nation-state. (Pablo Eyzaguirre, IPGRI, personal communication, June 10, 2005).

Table 3. Selected indicators of social homogeneity in the rural villages of Uganda[4]

Indicator	Elevation		All
	Low	High	
Ethnicity (%)	68.50**	95.10**	76.09
Religion (%)	58.20**	67.00**	59.50
Number of ethnic groups	5.40**	2.00**	4.57
Number of religious groups	5.00**	3.80**	4.59

** Significant at 1%

Like ethnic group homogeneity, religious homogeneity is greater in the highlands (67 per cent belonging to a single religion) than the lowlands (58 per cent). How these structures influence technology diffusion depends on which of these attributes most influences the nature and content of social interactions among households. However, no study has been done to examine whether social capital actually influences the adoption of banana management technologies in Uganda.

2.6. Summary

Banana is an important food security crop in Uganda but its production is threatened by the increased incidence and severity of biotic constraints. Yet the use of the crop management practices that have been developed to mitigate the negative effects of these constraints is not as high as expected. A number of social and economic factors are reported to influence management decisions. The effect of other factors such as market access and social capital has not been investigated.

[4] Due to scarcity of information in the literature regarding social processes, the information in this table was gathered from key informants