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ROCKWOOL FOUNDATION RESEARCH UNIT

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# FACTORS AFFECTING THE ADOPTION OF IMPROVED BANANA TECHNOLOGIES IN NORTHERN TANZANIA

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Written by

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**Factors affecting the adoption of improved banana technologies in Northern Tanzania**

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## ABSTRACT

This working paper is an empirical study of factors influencing the adoption by Tanzanian small-scale farmers of improved banana varieties and techniques introduced through the RIPAT project (Rural initiatives for participatory agricultural transformation). We find that even though the institutional rationales for introducing an improved banana technology in RIPAT and the farmers' rationales for adopting it are not correlating, the use of a demonstration plot enabled a successful interaction between the two rationales. It is suggested that the rapid adoption of the hybrid banana in RIPAT is owed to a project design that includes farmers' experiences and history, while at the same time acknowledging the effects of policies and institutional expertise.

## 1. INTRODUCTION AND BACKGROUND

Adoption of agricultural production technologies in developing countries is influenced by a wide range of economic and social factors and the degree of risk that farmers are willing and able to accept. It is important to understand the roles of these factors in order to ensure the development of appropriate technologies and the design of successful development projects. This paper examines the impact of such factors on the adoption of improved banana technologies as part of a food security and poverty alleviation project in Northern Tanzania.

This is done by comparing the implementing organisation's motives for introducing the improved technology with the farmers' motives for adopting it. The paper argues that even though the institutional rationales for introducing the improved banana technology and the farmers' rationales for adopting it are not correlating, the implementation has still been a success due to a project design that has succeeded in integrating agricultural expertise and local experience.

### 1.1. IMPLEMENTATION AND DIFFUSION OF AGRICULTURAL INNOVATIONS

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Understanding the factors affecting farmers' adoption choices relating to specific production technologies is crucial when designing successful agricultural interventions. New technologies seem to offer opportunities to substantially increase both food security and income among small-scale farmers in less developed countries and the implementation, adoption and diffusion of agricultural innovations have attracted considerable attention within agricultural development literature (Feder et al. 1985; Briggs, 1985; Ilbery et al. 1983).

Often, the economic, environmental and nutritional attributes of an improved crop play a crucial role when organisations and institutions plan agricultural interventions (Sabatier, 1986). Today, however, it is widely recognised that in order to be successful, local development should also take local needs and priorities into consideration (Chambers et al. 1989; 1991; Cornwall 2000;2002). During the past decade, there has thus been an increasing awareness of the importance of rural people's motivations, priorities and experiences in planning agricultural interventions, since non-economic factors also influence farmers' decision-making. Despite of this, there is still a lack of empirical examinations of agricultural interventions which build upon local people's own strengths and experiences while at the

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same time taking into account the effects of policies and institutional expertise. There is a need for more detailed information concerning the interaction between the factors influencing choices in terms of innovation and design on an institutional level and the factors influencing adoption decisions and diffusion on a household level.

The aim of this paper is to contribute to bridging this knowledge gap by focusing on the introduction of one agricultural innovation, that of hybrid banana in a village in northern Tanzania, and identifying the factors influencing the rapid adoption of this innovation.

## 1.2. ADOPTION OF IMPROVED BANANA TECHNOLOGIES THROUGH RIPAT

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The first RIPAT project was launched in Arumeru district in northern Tanzania in 2006. RIPAT stands for *Rural Initiatives for Participatory Agricultural Transformation* and the first project was initiated and funded by the Rockwool Foundation as part of its support for activities within the area of Food Security and Poverty Alleviation.<sup>1</sup> The project was implemented by the Tanzanian NGO RECODA and targeted eight villages on the southern plains near Mount Meru. The idea was to introduce local farmers to a so-called 'basket of options' consisting of a variety of improved crops (banana, maize, pigeon peas, lablab, etc.) and agricultural technologies (conservation agriculture, water harvesting, integrated pest management and banana cultivation). Two groups of farmers, each made up of 35 people, were established in each of the eight targeted villages. Over a period of three years, group members were given theoretical knowledge and practical training related to these crops and farming techniques. All the training for each group took place on a shared group demonstration plot, which was rented by the group members. On the basis of the learning that took place in the groups, each farmer was to select the products and technologies that best suited his or her needs and constraints at home, and to implement the techniques on his or her own farm. Furthermore, it was agreed that farmers would spread the crops and knowledge to family members and neighbours who were not part of the RIPAT group themselves, thereby creating a snowball effect.

I was, together with a group of researchers from the Department of Anthropology at University of Copenhagen, introduced to the RIPAT project in the spring of 2011, five years after the programme began and two years after the first RIPAT project officially finished. One of the aims of our involvement

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<sup>1</sup> Food security and poverty alleviation is one of the Rockwool Foundation's four programme areas. For more information, see <http://www.rockwoolfonden.dk/programme+areas/food+security+and+poverty+alleviation>

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was to examine the factors that had influenced the spread of technologies, products and forms of organisation in the first RIPAT project. That study, together with a qualitative evaluation and analysis of the RIPAT concept and approach and a quantitative impact evaluation, formed the basis of a book published in 2013<sup>2</sup> concerning the impact, implementation, adoption and spread of the RIPAT programme approach as a whole.

In conducting the fieldwork for this study I spent four weeks in Kwa Ugoro, one of the eight RIPAT 1 villages. From the very early stages of the research it became clear that banana played a key role. Though the implementing organisation, RECODA, had introduced a wide range of different crops and technologies, everyone seemed preoccupied with the introduction of banana, and the RIPAT project was commonly known in the area as 'the banana project'. Understanding the factors that made the introduction of hybrid bananas so successful is interesting, because it might teach us lessons that could be of relevance for other designers and implementers of development interventions.

One of the main conclusions of the study described and analysed in *Farmers' Choice* is that the achievements of the RIPAT project are owed in part to a pragmatic and flexible development approach that utilises both expert knowledge and local experience. On the one hand, the agricultural innovations introduced to the farmers were selected by RECODA, based on their agricultural expertise. On the other hand, farmers were free to choose from the range of innovations offered on the basis of what they could manage with the labour and land they had available, and also on the basis of their perceptions of their own best interests. It is this successful interaction between expert knowledge and local experience which forms the focus of this paper.

### 1.3. METHODS

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This paper is based on an empirical study of the factors that influenced the spread of technologies, products and forms of organisation in RIPAT 1, the first project. The fieldwork on which this paper is based was primarily carried out in Kwa Ugoro in Arumeru District in May-June 2010. Kwa Ugoro was chosen as one of the research villages for a qualitative evaluation of the RIPAT project, sponsored by the Rockwool Foundation. The methods applied included various kinds of interviews (some with a limited set of questions, others of a more in-depth and open-ended nature); direct observations (using narrative descriptions); participant observations; analysis of written project documents; and focus

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<sup>2</sup> H.B. Lilleør & U. Lund-Sørensen (eds), 2013. *Farmers' Choice – Evaluating an approach to agricultural technology adoption in Tanzania*. Practical Action Publishing, Rugby.

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group discussions. Furthermore several of the researchers stayed with local families during the fieldwork which enabled them to gain a basic understanding of the living conditions, opinions and priorities of local families.

The present paper takes a case study approach. This is in order to support the position that the explanations for rapid adoption of a specific agricultural innovation vary from one empirical setting to another. The conditions that contribute to the rapid diffusion of the improved banana technologies in Arumeru district can thus not necessarily be found or copied elsewhere, but the case study approach provides a detailed understanding of the empirical relevance of the theoretical discussion about the value of planning agricultural interventions on the basis of both expert knowledge and local experiences. The results of this case study should thus be seen as an analytical generalisation that supports previously developed theory on the subject (Yin 2003).

#### 1.4. CONTENT OF THE PAPER

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The paper is structured as follows. First, banana in general, and hybrid banana varieties in particular, are considered in a national Tanzanian context. The importance of the banana as a food and cash crop in Tanzania is considered, and some of the national strategic motives for introducing improved banana technologies are identified. Second, it will address the reasons for including banana in the RIPAT 'basket of option', and of method of introduction to the farmers involved. Third, the paper will identify the farmers' rationales for adopting banana, and discuss to what extent these factors were influenced by and correlated with the motives behind the project design.

## 2. THE ADOPTION OF IMPROVED BANANA TECHNOLOGIES IN TANZANIA – A NATIONAL PRIORITY

Today Tanzania ranks fourth in banana production in Africa (Uronu, 1993), producing approximately 3.7 million tonnes per year from some 403,000 hectares. Bananas are the main staple food for roughly 20-30 percent of the total population of Tanzania (Walker et al. 1984), with this section of the population living mainly in the highlands on the borders of the country. In the high-rainfall highlands of Kagera, Kilimanjaro and Arusha, about 70-90 percent of households grow bananas for their own consumption or as a cash crop, making banana the main source of food and the second or third biggest cash crop in these local economies (Kalyebara et al. 2007). Besides the Lake Zone around Kagera and the northern zone with Arusha, Kilimanjaro and Tanga as the major production areas, there are three other zones with high levels of banana production. These are Mbeya, Ruvuma and Iringa in the southern highland zone; Morogoro and the coast in the eastern zone; and the Zanzibar Islands (Kalyebara et al. 2007). These banana zones all have different cultivar preferences, mostly owing to the different local cuisines. The Lake Zone is well-known for its soft Matoke bananas. In the area around Arusha, where our fieldwork took place, the hard Mshare banana, used for roasting, is in great demand, whereas the Mbeya and Morogoro regions are known for their starchier varieties.

Because of the crucial role of bananas in relation to both local and national economies in Tanzania, bananas are increasingly becoming a national priority. Even though the level of production of bananas in Tanzania is high, it is still restricted to certain high-rainfall areas. Furthermore, the banana is grown mainly as a subsistence crop, and hence in accordance with local food preferences in the different areas. Most sales of banana thus take place within rather small areas; but due to the fragmented nature of local markets, it can be difficult for small-scale farmers to sell their surplus banana bunches in the main harvest season. In such cases, the bananas are used as fodder for animals. At the same time, there is a considerable national demand for to be met. Tanzania is experiencing rapid population growth. In 1975, the total population of Tanzania stood at 15.9 million. Since then, the population has grown exponentially, reaching a total of 41.3 million in 2007 (UNDP, 2010). In order to eliminate, or at

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least minimise, food insecurity for this growing population *and* to be able to produce bananas for sale across regional and national borders, an optimisation of the banana production process is needed.

Over the last couple of decades there have been a number of initiatives aimed at improving the production of bananas and adding to the value of the crop. One of the first banana programmes launched was the Kagera Community Development Programme (KCDP). The KCDP was launched through a collaboration of the Directorate General for Development Cooperation – Belgium (DGDC), the Tanzanian Prime Minister's Office (PMO), the Ministry of Agriculture (MoA), the Laboratory of Tropical Crop Improvement, the Belgian Administration for Development and Cooperation (BADC) and several other national and international organisations. In order to boost the production of bananas, the KCDP introduced several new hybrid varieties in the mid-1990s. The criteria for choosing these cultivars were their commercial value, their productivity and their resistance to pests and diseases. The last of these was a response to the increasing number of attacks from diseases and pests during the previous three decades. In addition to the introduction of the hybrid bananas, there has also been a focus on better crop management of existing banana varieties and on improved farming methods that allow the banana production area to be expanded to less fertile land.

The distribution of hybrid bananas and new techniques to grow them, through the RIPAT project can thus be seen as a part of a broader national and international initiative with the desired effect of creating a more stable level of consumption, either directly by increasing food security or indirectly through sale of crops. Consequently, the lessons learned in the first RIPAT projects could potentially contribute to new research that would not only be valuable for the further development of RIPAT but also contribute to a wider area of research on the introduction of hybrid bananas over the last 15 years.

### 3. INTRODUCTION OF BANANAS TECHNOLOGIES THROUGH THE RIPAT PROJECT

In the RIPAT 1 project, the implementing organisation RECODA decided on a range of improved agricultural technologies and practices appropriate for the villages in the RIPAT 1 project area that they believed had potential for improving local agriculture. One of these innovations was the hybrid bananas together with a new technique for cultivating them.

Bananas are generally perceived as being a crop that can only grow in areas with plenty of rainfall and possibilities for irrigation. One of the advantages of hybrid banana varieties is that they can be more tolerant of drought. This does require, however, that they are correctly cultivated. Correct cultivation for drought tolerance includes reduced planting density, making planting holes of greater size, and using greater amounts of manure in combination with mulching. Furthermore, it is crucial that the banana plants (stools) are watered regularly during the first four to six months after planting. The holes must be dug 90 cm deep and 90 cm across. The upper soil layer should be separated from the bottom layer and mixed with 5-10 buckets of farm manure before being returned to the hole. The technique used to plant the bananas is fairly simple, and although it is quite labour-intensive to establish the banana plot, banana cultivation generally requires less labour in the long run compared to maize, for example, because banana is a perennial crop. In addition to the actual planting technique, RECODA's training also included techniques for removing suckers, pest management, applying manure, irrigation, harvesting and marketing.

RECODA chose to include banana cultivation in the 'basket of options' offered to farmers on the basis of six specific advantages: 1) it is both a food crop and a valuable cash crop, and can give fruit throughout the year; 2) it provides employment throughout the year – unlike annual crops such as maize, which have very seasonal labour requirements; 3) it provides a higher level of food production per area per year compared with maize and many other crops; 4) it works very well in terms of crop/livestock integration, with the animals providing manure and the banana leaves being used for animal feed; 5) it is a perennial crop, which improves production stability over the years in areas that have a large variation in rainfall; and 6) it improves the environment by providing permanent soil coverage.

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These were thus the advantages identified at an institutional level which constituted the determining factors for including hybrid bananas in the RIPAT project and introducing them to the villagers; and as the evaluation of the RIPAT project showed, of the different agricultural options available to the farmers, such as improved maize, pigeon peas, lablab and cassava, improved banana varieties in particular became a favoured option. We will now turn to a consideration of the farmers in the RIPAT villages and look at the factors influencing their adoption choices, and we will explore the correlation between the factors influencing choices in terms of innovation and design on the institutional level and the factors influencing adoption decisions and diffusion on the household level.

## 4. FARMERS' ADOPTION OF BANANA TECHNOLOGIES THROUGH RIPAT

Though the basket of options offered by RECODA included a wide range of different crops and technologies, everyone seems to have been preoccupied with the introduction of banana. This was apparent when reading early reports about the RIPAT project, when talking to farmers, and when inspecting the original demonstration plots in the project villages, where the only crop still being grown two years after project termination was banana. There was almost no banana cultivation in the region prior to the RIPAT project. Two years after project termination, bananas were to be found growing wherever there was enough water. New farmers continued to adopt bananas, and those who had already adopted them were in the process of expanding their existing plantations. By the time of the evaluation, more than two-thirds of the RIPAT farmers and 13 percent of the non-RIPAT farmers grew the improved banana varieties (Quentin and Larsen, 2013). There were several factors that played a part in this success, and we shall explore some of the reasons behind the farmers' adoption decisions.

### BOX 4.1: SARAH MUNDA – A RIPAT FARMER

Sarah Munda joined a RIPAT group in 2006. Through the group she was taught how to grow bananas. During my interview with Sarah she explained: 'I was so pleased; banana used to be our "mouth opener", but I was sceptical, because no one had succeeded in growing bananas prior to the RIPAT project; but when I saw the results on the group demonstration plot, I was convinced that I could grow them myself.'

Sarah was given banana suckers by RECODA, and planted her first 20 at the beginning of 2006. She dug the holes herself, with some help from her children: 'I measured my field and made 20 holes, 1 metre wide and one metre deep, then I added manure and watered the plants every week, and at the beginning of 2007 I was able to harvest the first bunches.' Sarah agreed that it was a laborious task to establish the banana field, but once it was done the crop did not require much work. Before producing her first banana bunches, Sarah was able to harvest banana suckers. In 2006 she sold the first suckers to RECODA and other farmers in the village for TZS 500 each. With that money, she hired casual labour to dig more holes on her own banana plot, first adding 30 stools and then a further 50 in 2007.

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In 2008 she planted 60 more suckers, but this time they were from local banana cultivars, because she wanted some variety and because she saw that there was a demand in the village. In 2010 Sarah was hit – like all the other farmers in the village – by a spell of drought. It affected her farming production greatly, including her banana harvest. Some young banana plants which she planted that year dried out, and the same thing happened to her maize; however, some of the older banana plants were able to withstand the drought and still produced bunches, though not as many as before.

When Sarah was asked about the advantages of growing bananas, she mentioned several things. Apart from providing herself with valuable food, Sarah has also been able to sell bananas to others; this gave her the possibility of buying household supplies all year around, rather than only in the traditional harvest season. Furthermore, the banana leaves provided fodder for her goats, saving her from the time-consuming task of finding green grass in the dry season. In return, her animals produced manure, which means that she does not have to buy artificial fertiliser.

#### 4.1. ADOPTION BECAUSE OF HISTORY

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One crucial factor that took precedence over all others when my informants told me why they had chosen to adopt bananas was the history of the people of the area. Large parts of the population in the study area were Arush and Meru people originating from Mount Meru. Mount Meru is one of the major centres of banana production in Tanzania, and banana is naturally the major staple food in the area. When Sarah talked about bananas as her ‘mouth opener’ she was referring to the fact that banana was the first food she could remember eating as a little child.

Many Arush and Meru people were forced to leave Mount Meru in the 1950s due to the shortage of arable land on the mountain. This shortage was in large part created by colonial and post-colonial policies whereby huge tracts of land were confiscated to be given to European commercial farmers (Larsson 2001:32). Many informants told stories about how they or their parents had migrated to the lower plains, south of Mount Meru. Many brought bananas with them and tried to cultivate them using traditional planting techniques, but without much success, because the fertility of the land on the plains was much lower than that of the land on the mountain, and water was much scarcer. The Meru and Arush populations on the plains never entirely gave up trying to grow bananas, and a few people continued to plant bananas on a small scale, but with poor results. However, although most people had to give up trying to cultivate bananas, they remained familiar with banana cultivation

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through the close ties that they maintained with family members living in Arusha and on Mount Meru. Bananas thus remained an important component of the traditional cuisine and were regularly consumed. Getting the chance to grow banana instead of buying them at a fairly high market price was thus a welcome opportunity for the farmers participating in the RIPAT project.

#### **4.2. ADOPTION AS A CONSEQUENCE OF POPULATION GROWTH**

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The introduction of hybrid bananas and new planting techniques on the plains around Mount Meru thus corresponded to a need among the recipients of the RIPAT intervention that had arisen due to the increased population density on Mount Meru itself. The successful introduction and adoption of hybrid bananas made sense in the light of the agricultural history of the area. Banana cultivation has always been the main strategy of the Arush and Meru people on Mount Meru for intensifying agricultural production in order to keep up with population growth and thus to sustain one of the highest population densities in Africa. This strategy rested on the transformation of pasture for livestock into land for maize and bean cultivation, and on the transformation of maize and bean fields into banana plantations; each step made possible the sustenance of a higher population density. One hundred years ago, the area in this study was used as pasture for livestock. As the area became inhabited during the 1950s, these pastures were transformed into maize and bean fields, and with the RIPAT project, some of these maize and bean fields were transformed into banana plantations, thus reproducing the same historical intensification strategy as that which had taken place on Mount Meru over the previous two centuries.

#### **BOX 4.2: DIFFUSION OF HYBRID BANANAS**

In 2009, Sarah Munda gave 20 banana suckers to Petro Murriel. Petro is Sarah's uncle, and Sarah is a frequent visitor to his house. Petro's wife was the one who first got interested in the hybrid bananas; she stated that 'Sarah told me about it and I like bananas.' So she talked to her husband about planting suckers. He went to the demonstration plot and saw how good the bananas looked there, and he saw that other villagers had planted bananas with great success; so he agreed to try it out, as he saw no reason to refuse. They asked Sarah for suckers and she gave them 30: – a mixture of the hybrid RECODA banana and a local variety. Sarah came and measured the holes and told them how to plant, water and add manure. She also told them how big the holes should be: 'one step wide, one step long, and the depth should be to the knee.' Petro paid for someone to come and dig the holes, but he collected the necessary manure himself. Because Sarah was a frequent visitor in the house, she often

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supervised the banana field. In the beginning the plants grew well, but then the drought set in and the plants died. Petro has not been discouraged, though. He knows the reason for the failure, so he will try again, and this time he will dig a well first.

Sarah also gave seedlings to John Mgone. John is Sarah's neighbour, and he had followed the establishment of her banana plot with interest. Every day he saw how she was digging holes, adding manure, watering and so forth, and he saw that her bananas grew well. He was a little sceptical because of the lot of work it required to establish a banana plot, but he saw many other RIPAT farmers growing healthy-looking banana plants and selling the fruit in the village or in town at a good profit. He went to see Sarah and asked if she could help him, and she gave him suckers and taught him exactly how to plant them. John planted 20 banana stools.

### 4.3. ADOPTION BECAUSE OF PROJECT DESIGN

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An important component of the RIPAT projects was the demonstration plot. Each RIPAT group rented a plot of at least 1 acre, and group members got hands-on experience in how to cultivate the crops introduced through weekly monitoring and training from RECODA staff members. This training continued throughout the three-year period of the project, enabling the group members to receive continuous guidance on the management of their crops throughout the growth cycle. The group idea is interesting, because it is cheaper and more efficient to teach 30 farmers together and have only one demonstration plot than to deal with 30 individual farmers and demonstration plots; however, the group idea also served a larger purpose. As was the case with Sarah, several of the farmers I interviewed during my fieldwork emphasised the importance of the demonstration plot with regard to the decision to adopt hybrid banana. Many farmers told me that they initially were sceptical about the idea of growing banana, because of previous bad experiences with the crop. Another reason for their initial reluctance was their vulnerability as poor farmers. With most farmers owning only one or two acres of land and having no other income worth mentioning, they could hardly afford to experiment too much with their own limited farmland. A wrong farming decision could be fatal, and from such a perspective it was better to take a calculable risk (for example with maize, which is an important staple food which requires little management, even though it is not very drought-resistant) than to take a risk of an unknown level, no matter how appealing the potential gains might seem. Other factors to take into account are that banana is a perennial crop, which means it occupies farming land permanently,

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and that establishing a banana field requires hard work and time-consuming management input in the first year. Growing bananas is thus a long-term investment, a factor which raises the stakes for the individual farmer. From such a perspective, the demonstration plot is crucial because it provides a persuasive example, showing the farmers that banana growing in the area is possible. It enables them to take an informed decision based on actual hands-on experience, and also allows for them to share the initial costs and thereby spread the risk.

#### **4.4. ADOPTION AS A GOOD FARMING AND LIVELIHOOD STRATEGY**

Another factor that the case histories recounted above point to as being important for the diffusion of hybrid banana varieties is the relatively simple planting technique involved. There are instructions that need to be implemented with regard to disease management, wind shielding and cover cropping, but the planting basics are easy to explain, easy to understand through observation, and consequently easy to implement. The only part of establishing a banana field that seems to require some kind of expertise relates to measuring and laying out the field prior to digging the holes. Farmers who were part of the RIPAT group were able to do this for themselves, but other adopting farmers often paid for or were given help from RIPAT group members.

Another valuable feature of banana plants was stated to be that they are perennial and thus produces food all year around. This did not imply that the farmer was always guaranteed a good harvest, but they seldom experienced the total failure of their crops, as could be the case with annual crops, where the timing of planting and the timing of rains were crucial parameters for a good harvest. As one of my informants expressed it during an interview, ‘Maize is the poor man’s crop – in times of drought it’s only the bananas that are green.’ This also made the banana a very persuasive plant in itself, and the lush green banana plots received a lot of attention when all other crops looked pale and dry under poor rainfall conditions. Several banana farmers spoke about strangers stopping and enquiring about their plots.

#### **BOX 4.3: ELIAS MATIKU – AN ADOPTING FARMER**

One day, as we were walking through one of the RIPAT 1 villages, we passed Elias Matikus’ house. Inside his compound was a relatively small but very impressive banana plot with fine-looking bananas. We entered the gate and found Elias on his banana plot.

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Elias worked as primary school teacher in the neighbouring village. He was rather well off, owning a smart house with a big solar panel. Because of his job, he did not have the time to be a member of the RIPAT group, but he soon became interested in growing bananas because he loved eating them and because he knew that that banana would be a good cash crop. He contacted the group and asked one of the group members if he could buy some bananas. He got some suckers, which he planted. In addition, he planted 20 stools of a local banana variety used only for roasting, also planted using the planting technique recommended by RECODA. He got the local bananas from his neighbour, who had got the suckers from family members on Mount Meru. Elias had recognised the local banana variety and had bought some suckers for his plot to mix with the improved ones from RIPAT – he thought it would be a good idea to have bananas for different purposes.

To establish his banana plot, he had hired villagers to come and dig the holes, and he had paid a RIPAT member to give him training and guidance. The RIPAT group member had measured the field and taught him about watering, cow manure and so forth. He also paid regular visits during the first year to see how the plants were progressing. The cost of establishing the banana plot had been TZS 59,000 (TZS 1,000 per hole and TZS 500 per sucker), and after a year of watering and continuously adding cow manure he had been able to harvest his first bananas. The first year he had sold almost 30 bunches to fellow villagers. Elias told me that the hybrid bananas were the most popular bananas in the village because they were multipurpose. However, it was the local roasting variety that fetched the best price, because it was a traditional banana used for ceremonies and social events, and it could not be replaced with other varieties. Elias' bananas had brought him quite a lot of attention, and many people had stopped by and asked for suckers and advice.

The case histories indicate the obvious advantages of banana as both a valuable food crop and a cash crop. It is important to have in mind that the hybrid bananas were just one out of a number of cultivars available, and that the different banana zones in Tanzania all have different preferences with regard to varieties, mostly owing to the differing local cuisines. The most common way to group bananas is based on their uses, namely cooking, brewing, roasting and dessert. The cooking banana is harvested green and is peeled, boiled or steamed. Brewing bananas are harvested when mature and then ripened and squeezed to produce juice, which is then fermented with sorghum flour to make banana beer. Roasting bananas are harvested and ripened before roasting, and sweet (dessert) bananas are only eaten when ripe.

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The hybrid banana can be used both as a cooking and as a dessert banana, depending on whether the farmers harvest them before or after ripening. The multipurpose nature of the hybrid variety thus made it of particular value. On the other hand, there were local banana varieties that were more highly valued for specific local dishes. Many farmers had thus started to mix the hybrid bananas with local varieties, both for their own consumption and also because they saw a demand in the area. This also contributed to the diffusion of banana growing in the area.

Lastly, as Sarah explained, growing bananas fits in well with keeping livestock. Sarah is, like most of her neighbours, an agro-pastoralist, which means that she combines animal husbandry with crop cultivation. Growing bananas thus gave her a readily available supply of animal fodder, and in turn she could use the animal manure for her banana stools, saving her both money from not having to buy fertilizer and time previously spent on finding food for her animals.

## 5. INSTITUTIONAL PLANNING AND LOCAL EXPERIENCE

The aim of this paper was to explore some of the contributing factors influencing the successful implementation of improved banana technologies in the RIPAT project. So far the paper has looked at the motives for introducing hybrid bananas in Tanzania from the point of view of a top-down approach – that is to say, the introduction of bananas as a national strategy, as well as the more specific reasons for including hybrid bananas in the ‘basket of option’. This was followed by an exploration of some of the factors influencing adoption decisions from a bottom-up point of view, i.e. the factors influencing the farmers’ decisions to adopt the hybrid banana introduced through the RIPAT project.

From a national point of view, the determining factors for introducing the hybrid banana are mainly based upon its value as a food and cash crop for a rapidly growing population. The effect desired from promoting the hybrid banana among Tanzanian farmers was thus to create a more stable level of consumption, made possible through a focus on better crop management and through the attributes of hybrid bananas with regard to productivity, pest resistance and drought tolerance. From such a perspective, the transformation of maize fields into small banana plantations in Kwa Ugoro can be seen as an example of how the introduction of hybrid banana can provide answers to the challenge of increased population density. This also correspond to RECODA’s motives for including improved banana technologies in their ‘basket of options’, more specifically the argument that banana provides a higher level of food production per unit of area per year compared with maize and many other crops. However, while this positive attribute might have had an influence on farmers’ choices with regard to continuing to grow bananas or to expanding their existing banana plots in Kwa Ugoro, it had little direct influence on the initial adoption decision by the RIPAT farmers.

Neither was the fact that bananas improve the environment by providing permanent soil coverage mentioned as having any effect on farmers’ adoption decision. The advantages of the bananas in terms of crop/livestock integration were mentioned by some farmers as a positive attribute, but again this point was merely mentioned as a positive side effect and not as a factor directly contributing to the decision to adopt the banana in the first place. They same applies to RECODA’s emphasis on the fact

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that bananas provide employment throughout the year in comparison to annual crops; again, this did not seem to influence adoption decisions.

On the contrary, the qualitative evaluation of the RIPAT project showed that the laborious task of establishing a banana field was a constraint that slowed down adoption rates, especially for households with limited resources of labour or finance (Gausset and Larsen, 2013).

The study shows that the most important contributing factors mentioned by the RIPAT farmers in terms of choosing to adopt bananas actually had little to do with the agricultural or economic advantages of the hybrid banana as listed by RECODA. What appear to be the most important factors for the initial adoption of the hybrid banana are rather firstly RECODA's implementation strategy – especially the demonstration plots and secondly the fact that the farmers in Kwa Ugoro are Wameru and thus familiar with growing bananas, and value them as a traditional staple food. This supports the argument that local development, in order to be successful, should take local experience and priorities into consideration (Chambers et al. 1989; 1991; Cornwall 2000; 2002). However, in the RIPAT case the food priorities of the farmers were not enough to convince them to grow bananas because their experiences with growing banana had not previously been successful. This also meant that RECODAS rationales for introducing the bananas had little effect if it wasn't for the demonstration plot where RECODA was able to show the farmers in Kwa Ugoro that it was possible to grow bananas using a improved planting technology. The demonstration plot thus had two purposes. On one hand it served as persuasive display where RECODA could demonstrate that their expert assessment in terms of the potential and advantages of the improved banana technology was accurate. On the other hand the demonstration plot enabled the farmers to take an informed decision based on actual hands-on experience, and it allowed the RIPAT farmers to share the initial costs and thereby spread the risk of establishing a banana field. The RIPAT case thus also serve as an example of the importance of intelligent project design, as it was the RIPAT demonstration plot that convinced RIPAT farmers to try on the agricultural innovation presented to them despite their past experience and initial scepticism.

This is not to say that the economic and agricultural characteristics of the hybrid banana did not influence the high rate of adoption. There was indeed a correlation between RECODA's motives for introducing the hybrid banana and the farmers' motives for adoption especially in terms of the hybrid bananas attributes as a perennial crop. The fact that the bananas could produce fruit all year round was an important factor for many farmers. RIPAT farmers and non-RIPAT farmers who had adopted

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the banana also mentioned its advantages as a cash crop, and knew of this because of their heritage. The advantages of the banana as both a food crop and a cash crop influenced its continued spread in Kwa Ugoro, but the question is whether these advantages would have had the same large-scale effect if it is was not for the RIPAT project design where the demonstration plot served as a risk-avoiding mechanism in the initial stages of the first RIPAT project.

RECODAS rationales for introducing the hybrid bananas and the farmer's rationales for deciding to adopt this agricultural innovation in the initial stages of the first RIPAT project did thus not initially correspond but the project design created a neutral space, the demonstration plot, that allowed expert knowledge and local experience to find common ground. The specific conditions for the successful implementation of the improved banana technology in Kwa Ugoro might not be replicated elsewhere but the lessons learned in terms of the successful interaction between institutional planning and local history and experience serve as a good example to keep in mind for future interventions.

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