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Banana distribution and their seed systems in central and eastern Kenya

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Abstract Bananas (*Musa* spp.) serve as food, income resource and animal feed in addition to other environmental benefits. In Kenya, the crop is mainly grown and managed by smallholder farmers. Over the last two decades, banana production has been on the decline. Pests, diseases and limited access to adequate clean planting materials constitute priority problems. This study aimed to determine distribution of bananas varieties, and the availability and sources of planting materials in Central and Eastern provinces of Kenya. Use of naturally regenerated suckers as planting materials exceeded 90% and continuously perpetuated the spread of banana diseases and pests that substantially reduce yields. Prospects for increasing seedlings supply through micropropagation has not been successful due to high cost of tissue cultured seedlings leading to low adoption (<60%). There is a gap between farmers with varying resource capabilities in accessing and using good quality planting materials. This can be resolved by interventions that supply farmers with healthy and affordable banana seedlings. Macropropagation, which is a simple, cost effective method that has been used successfully in other countries has great potential to address issues.

Key words: Macropropagation, *Musa* spp., seedlings systems

Introduction

The East African region produces half of Africa's banana crop, providing staple food and a source of income to an estimated 20 million people (INIBAP, 1991). It is the largest banana producing and consuming region in Africa. There are four main types of bananas grown in East Africa: cooking, roasting, brewing and dessert bananas. Kenya does not have roasting and brewing bananas. Banana is said to be the most traded crop in Uganda (Aliguma & Karamura, 2006), while in Kenya it is an important cash crop in Central region where both cooking and dessert varieties are grown. It is an important food crop in Kisii region; Nyanza province. In the recent past, banana has become an important cash crop for semi- intensive medium scale farmers who supply the urban markets in the country (Nguthi *et al.*, 2004). It covers an estimated 2% of the country's total arable land (MALDM, 1997). The crop is predominantly grown by small scale farmers, who have average holdings of just 0.3 hectares (Qaim, 1999).

Despite the importance of bananas, the crop's production has fallen over the last 20 years (MOA, 1994). This decline is attributed to several factors, among them lack of enough clean planting materials. Scarcity and high cost of clean planting materials in Kenya and East Africa constitutes a priority problem (Wambugu *et al.*, 1981). Pests and diseases are considered the most important constraint. Common farmers practice of using sword suckers (conventional method which has been used for decades to obtain seedlings) has continuously perpetuated pest spread (Qaim, 1999) which are estimated to reduce yields by up to 90%. The resulting yield losses make banana a relatively expensive commodity for consumers and reduce the cash earnings for the producers (Qaim, 1999).

To remedy the situation and increase availability of banana seedling, tissue culture (TC) plantlets were introduced. Tissue culture assures more rapid production of healthy, vigorous and disease free planting materials (Swenmen, 1990). However, due to large capital investments required for TC capacity, the plantlets produced are priced above what would be affordable to many small scale farmers (Mwangi and Muthoni, 2008). Farmers rarely buy new planting materials; instead they use suckers from their farms and neighbours, this practice continues due to lack and high cost of clean planting materials. There is, therefore, a need for a feasible and easy technique (Lopez, 1994). To address the gap in provision of affordable healthy banana seedlings, a cheaper seedling production technology has been introduced to Africa. Use of detached corm method (referred to as macro-propagation) involves stimulation of lateral growth of multiple latent buds in a corm within a chamber where humidity and temperature are controlled. Scarification of buds can further increase suckering by a factor of 2-10 (Tenkouano *et al.*, 2006). A corm is capable of producing 10 to 30 plantlets in four months, but the productivity may vary with banana cultivar used and kind of bud manipulation. Observations in Cameroon and Nigeria show that seedlings obtained through macropropagation have uniform size and they tolerate post-establishment better than tissue cultured plants (Tenkouano *et al.*, 2006). In Kenya, limited evaluation of this technology has showed good propagation potential for cv. Grande Naine while cv. Kisii Green propagated rather poorly in areas higher than 1800 meters above sea level,

making it apparent that temperature is one of the factors that affect propagation efficiency (Mwangi *et al.*, 2007). It is against this background that the ongoing research was initiated to evaluate macropropagation method against other methods, so as to recommend and promote adoption of this technology to increase seedlings availability at farm level.

Material and Methods

Six districts were chosen from the banana growing areas, Central Kenya: Kirinyanga, Mathioya and Murang'a and Eastern Kenya: Imenti South, Meru Central and Embu East. A structured questionnaire was designed to meet specific objectives of the study. Extension/Agricultural officers were contacted to assist in identifying survey areas and farmers. The questionnaires was administered to the farmers by the interviewers who filled the corresponding question according to the farmers' response to the questions. More information was recorded through direct observation during a transect walk on each surveyed farm. At least 40-50 farmers were interviewed in each district. The data were analysed using descriptive statistics.

Results

Different production constraints were identified and varied between districts, with pests and diseases being the most important constraint and cutting across all surveyed districts. It was also cultivar dependent, with high incidences of panama wilt in Kirinyanga District; Central Kenya, where variety Kampala was dominant as compared to Eastern districts where resistant Cavendish cultivars dominate. Drought was equally important, although it depended on availability of water and capability of the farmer to implement irrigation on his farm. In Mitunguu (Imenti South), collective effort of farmers groups overcomed water scarcity through implementation of water projects that irrigate the banana farms from river water. Marketing and scarcity of land were also among the major production constraints in the area. Cost of TC plantlets was found to be 3times (KSH 100 = US $ 1.20) that of the conventional suckers (KSH 30 = 0.36 US). Both TC and naturally regenerated banana seedlings were being used in all surveyed districts but at different levels (Figs. 1 and 2). Eastern and Central Kenya have both cooking and ripening bananas, with more dessert varieties (> 80%) compared to cooking varieties (10-20%). Cavendish and Kampala were the most dominant dessert varieties (90%).

Discussion

Pest and diseases ranked the most important constraint. Considering that majority of the farmers were using suckers as planting materials there appears to be a relationship between the sources of planting material and pest and disease dissemination. This was consistent with the report of Wambugu *et al.* (1981). There appeared to be a relationship between low adoption of tissue culture plantlets and the cost of the plantlet which almost triples the cost of the conventional suckers. These findings were consistent with findings by Mwangi & Muthoni (2008) who reported that due to large capital investments required for tissue culture capacity, the plantlets produced are priced above what would be affordable for small-scale farmers. The fact that majority of the farmers were aware of TC materials but adoption was low implies that there is a gap between knowledge and practice, with most farmers continuously using suckers to establish a new crop. Hence there is need for a seedling production method that is more affordable to increase banana seedling availability at farm level (Lopez, 1994).

In countries such as Uganda, Nigeria and Cameroon, macropropagation technique has been used to increase banana seedling at farm level. This technique is simple to understand; it requires low capital investments (Faturoti *et al.*, 2002) and is seen as an opportunity in Kenya to provide the much needed seedlings to increase banana production.

Although several dessert varieties were grown, Cavendish and Kampala were the commonly grown varieties, (Nguthi *et al.*, 1999). This is because they have big bunches and long fingers, which fetch good price in the market. Cooking varieties were grown by between 10-20% of the farmers, which suggests they have lower market

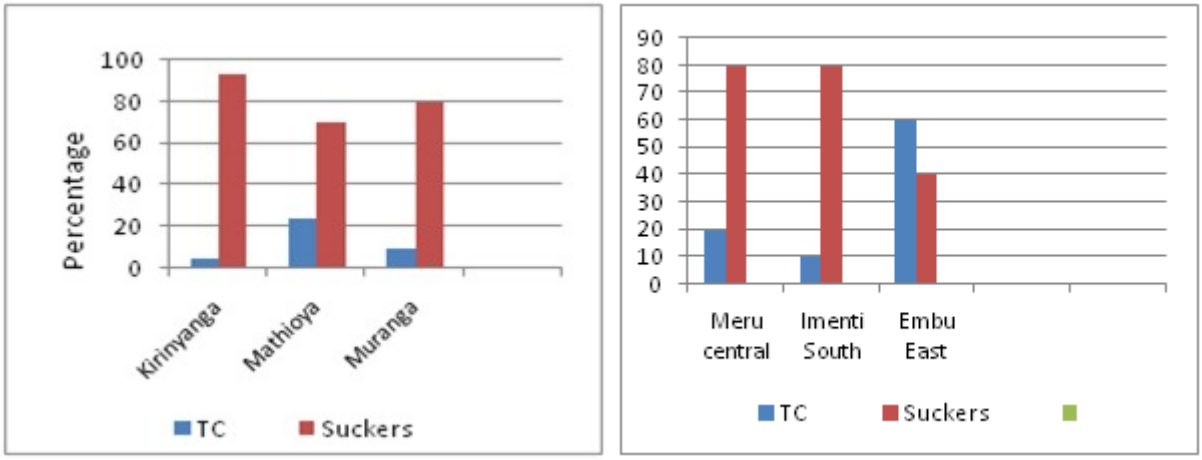

Figure 1 and 2. Use of tissue culture and naturally regenerated suckers by banana farmers in Eastern and Central Kenya.

demand. Traditional varieties were of negligible, as they were being replaced by improved varieties with higher market demand. This implies that distribution of banana varieties is more market driven than being solely a food security crop. Although the dessert Kampala variety has high market demand in Central Kenya, its actual production was below 40% due to susceptibility to panama wilt. In the same area, the resistant Cavendish varieties were at 60%, implying that pest and disease are one of factors determining distribution of specific varieties.

Climatic factors were also found to influence distribution, Kampala variety was found to be more adopted in drier areas including Kirinyanga and Imenti South; while Cavendish varieties were more in cooler areas including Meru Central. These findings are consistent with Wambugu & Kiome (2001), who reported marketing and environmental factors to be among factors that influence distribution of bananas in Kenya.

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