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Financing, handling, hardening and marketing of tissue culture-derived planting material through nurseries: the case of banana in Kenya, Uganda and Burundi.

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Abstract

The distribution of contaminated planting material (suckers) remains a major cause of spread of pests and diseases in banana. A traditional subsistence staple in East Africa, banana is becoming increasingly a commercialized commodity in the region. Essential for effective commercialization of this crop, however, is the supply and use of uniform and healthy planting material. Tissue culture (TC) technology can help provide this. However, TC plantlets are delicate and require substantially greater care and handling than conventional sucker planting material. To distribute TC seedlings to farmers and improve their robustness for successful use on farms, numerous hardening nurseries have been established by TC producers in Kenya, Uganda and Burundi. These nurseries are pivotal in the dissemination of plantlets. In 2008, financing, handling, hardening and marketing of TC-derived planting material through nurseries was assessed using semi-quantitative interviews of nursery operators. The nurseries in Kenya and Uganda are mostly farmer-led and obtain their material from the producer. In Burundi, the nurseries are owned and centrally managed by the producer, while daily activities are handled by technicians. In each country, water supply was identified as a key limiting factor, as the young plantlets desiccate easily. In farmer-led nurseries, plantlet transport and phytosanitary measures, such as soil sterilization and plant protection, are often limited, which can lead to significant plant losses. Governmental and non-governmental institutions purchase large fractions of the TC planting material. Public extension services for TC nurseries were evaluated as poor, leaving the TC producers as the single source of information for nursery operators. Additionally, plantlets tend to be viewed as relatively expensive, while supply is currently sub-optimal, compared to traditional planting material, resulting in a relatively limited and exclusive market. TC planting material in the region is therefore yet to become sufficiently available for most banana farmers.

Introduction

The distribution of contaminated planting material (suckers) remains a major cause of spread of pests and diseases in banana (QAIM 1999, WAMBUGU et al. 2000). A traditional subsistence staple in East Africa, banana is becoming increasingly a commercialized commodity in the region.

Essential for effective commercialization of this crop, however, is the supply and use of uniform and healthy planting material. The tissue culture technology has the potential to help provide this

(SONNINO ET AL. 2009). However, TC plantlets are delicate and require substantially greater care and handling than conventional sucker planting material. To distribute TC seedlings to farmers and improve their robustness for successful use on farms, numerous hardening nurseries have been established by TC producers in Kenya, Uganda and Burundi. These nurseries are pivotal in the dissemination of plantlets (STOVER, SIMMONDS 1987).

Methodology

In autumn 2008, financing, handling, hardening and marketing of TC-derived planting material through nurseries was assessed using a pre-tested semi-quantitative questionnaire with which all nurseries affiliated with commercial tissue culture producers in Kenya, Uganda and Burundi were interviewed through a census. All interviews were audio-recorded and all nursery sites were GPS mapped.

Results

In Kenya a large part of the 17 evaluated nurseries is situated in the Central Region. Altogether 6 nurseries are distributed in the districts of Embu (2), Meru (2) and Kirinyaga (2). With 4 nurseries each the Eastern Region and the Coastal Region follow, while the Western Region has only 3. The nurseries in the Eastern Region are almost all located in the district of Machakos (3), only 1 is in Kangundo. Kwale and Kilifi with 2 nurseries each are the districts represented in the Coastal Region and in the Western Region the nurseries are located in Vikiga, Rachuonyo and Kakamega. Overall 6 nurseries have been abandoned.

In Uganda all tissue culture nurseries interviewed (n=15) are situated in the central region districts of Luwero (3), Mityana (1), Mukono (6), Nakaseke (1) and Wakiso (4). 3 of these nurseries have been abandoned and one is yet prospective.

In Burundi only one of the two commercial producers runs external nurseries. There are 4 of them, one each located in the northwestern districts of Gitega, Kayanza, Ngozi and Kirundo.

The nurseries in Uganda and Kenya are all run as private businesses, while the nurseries in Burundi are managed and maintained by technicians hired by the tissue culture producer.

The mayor challenges indicated by nursery operators in Kenya and Uganda are primarily financing, followed by input availability (esp. water), transport management and customer availability. In Burundi the nursery operators are largely dependant on purchases from few, large customers, mainly Governmental Organizations (GOs) and Non Governmental Organizations (NGOs), using funds from donors. Other problems there were input shortages, especially water just like in the two other countries, and the lack of adequately skilled, affordable personnel.

The handling and hardening process of the plantlets varied among nursery locations and affiliations. The effect of training received from the producers or from extension agents became apparent by the frequency with which details of certain handling practices were mentioned during the interviews, especially in the way soil sterilization, potting and watering procedures were described. However, every nursery found its own way of amending the procedures so that they fit the local needs. In some cases the methods were applied or changed in a way that reduced their effectiveness or were even destructive. That was the case for example where soil was insufficiently sterilized or where watering schemes were suboptimal. Only 27% of the nursery screen houses were evaluated to be in a good maintenance condition, putting most of the young plants in a poor position to start their life under outside laboratory conditions. In Uganda and Kenya only 4 operators used a humidity chamber to reduce the impact of plant stress from the transition to the new environment.

Commonly the plantlets stay in the nurseries for 2 to 3 months before they are sold. Sizes of plants bought for hardening and sold to customers vary accordingly. On average Kenyan

nurseries receive 6,3 cm-tall plants and sell them at a size of 20,3 cm, in Uganda this range is 5,7-23,3 cm, and in Burundi 3-30 cm.

In Uganda and Kenya payments due for personnel, preparation of the soil mixture, water and general plant losses accounted for the highest costs. Details of individual nursery financing and costs could not be surveyed in Burundi. The financial details of the latter nurseries are not known to the nursery operators due to the fact that they are hired technicians, not independent entrepreneurs.

Average plantlet sales prices to the end users vary. In Kenya a plant bought ready for planting from a nursery costs 1,20 US\$, in Uganda 0,95US\$ and in Burundi 1,00US\$. The entrepreneurial nursery operators of Kenya pay 0,69US\$ on average for a plantlet from the lab to harden, while their Ugandan colleagues pay 0,58US\$.

The average plantlet numbers sold per nursery are 2340, 4986 and 69250 in Kenya, Uganda and Burundi respectively. Figure 1 shows the relationship between profits and the number of plantlets sold for 25 Kenyan and Ugandan nurseries. The number of plantlets sold and the profit made were significantly correlated ($R^2= 0,63$). The more plantlets are sold, the less significant is the effect of losses and fixed costs on the business. Operators handling higher numbers are more likely to make profit than their colleagues selling fewer plantlets.

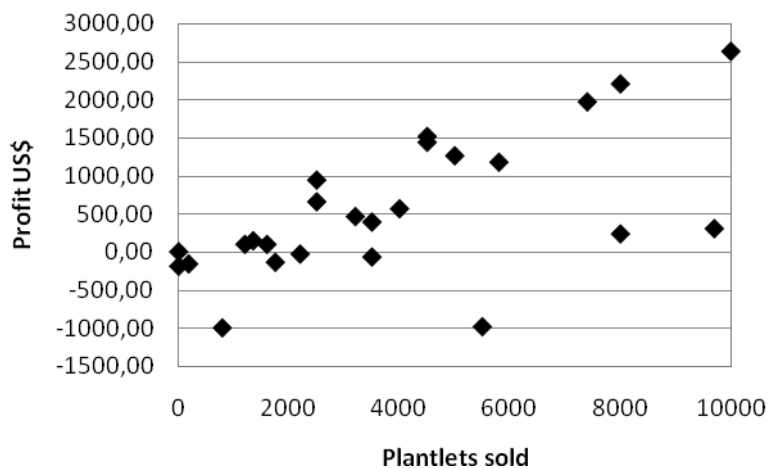


Figure 2: Relationship between profits and plantlets sold for 25 Kenyan and Ugandan nurseries.

However, there is quite a variation in profits as a function of plantlets sold. Several pairs of two different nurseries selling approximately the same number of plantlets perform very differently in terms of their profits. If a line is drawn connecting all the nurseries which have the best profit recorded for this plantlet number, quite a number of them is below that frontier line and thus below the optimal possible efficiency. Problems with planning of seedling quantities ordered, customers not picking up their orders or untimely plantlet supply from the producer, insufficient protection of the plantlets in the nursery, primordial book keeping and lacking enforcement of customer payments or reimbursement for plantlets delivered unfit for survival can inflict considerable or even total loss. The performance differences between the nurseries with comparable plant numbers can be retraced to the existence and severity of one or more of these issues. Additionally, different locations have different costs for inputs and transport as well as different requirements for plant accommodation and weaning (soil preparation, plant protection, watering). But still, the variations are so wide in places that some operators can obviously not make optimal use of their investments in inputs and installations.

Regarding external financing 9% of the surveyed nursery operators in Kenya and 18% in Uganda indicated experience with micro credit services. A bank loan is available for 40% of the operators in Kenya and for 28% in Uganda.

Neither in Kenya nor in Uganda did the supply match the demand of tissue culture plantlets in the year before the inquiry. Almost all nursery operators could sell more plantlets if they had the capacity and if the plants could be supplied in greater numbers. In Burundi the demand could be met, yet as NGOs are the mayor buyers with varying planning procedures, donor funding and approval dependencies, plantlet production and distribution logistics to satisfy the demand of this customer type becomes the mayor challenge.

In Kenya and Uganda most of the nurseries' clients are farmers but this doesn't always mean that the plantlets are paid by farmers with own funds. Often NGOs or GOs pay all or parts of the plantlet price. However, the farmers benefitting usually collect the seedlings for planting from the nurseries personally.

For promotion purposes 14 Ugandan and 14 Kenyan nurseries use a demonstration plot. In 73% of the cases however, these are poorly maintained. In Burundi no plots with a demonstration character have been put up by the nurseries.

Promotion of the nurseries sales activities takes place through extension providers, certain ministries and word of mouth communication in Kenya. In Uganda word of mouth promotion is prevalent, followed by extension services and commendations of the plantlet producer. The latter is the sole promotion method in Burundi.

Conclusions

The spectrum of feasible nursery business setup options and the number of open choices available to nursery operators within the tissue culture plantlet markets current organization in East Africa decreases along a gradient from Kenya, Uganda to Burundi. While in Kenya nursery operators still have a small choice of options of who they want to work with there is only one option Uganda and Burundi, with the latter having high expectations towards personnel qualification and offering a salary paying position, not an independent business.

From the number of abandoned nurseries and their locations it may be reasoned that running a nursery business is harder in certain locations than it is in others. Either due to climate, input, especially plantlet, availability, receptiveness and size of outlet markets or due to availability of help in the form of extension services, the tissue culture producer or NGO/GO support. Nursery operators willing to upscale their operation are mostly held back by a shortage of own, or reasonably priced foreign capital to finance such expansions. TC demand in Uganda and Kenya is partly supported by domestic or foreign aid, while in Burundi continuation of donor support is inevitable to sustain the business. The ubiquitous presence of sucker planting material and the fact that TC plantlets tend to be viewed as relatively expensive, while supply through nurseries is currently sub-optimal, resulting in a relatively limited and exclusive market, TC planting material in the region is yet to become sufficiently available for most banana farmers.

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