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Control of sweetpotato virus disease through Farmer Field Schools approach in Kagera region, Tanzania

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Abstract. Sweetpotato, *Ipomea batatas* (L) is an important crop grown for food and income generation in Tanzania. In Kagera region, it is the most important crop grown by resource poor farmers. The crop has recently become even more important due to the decline in banana production due to pests and diseases. Despite its importance, poor soil fertility, pests and diseases affect its productivity. A survey conducted in 2003 indicated sweetpotato virus disease (SPVD) was a major problem that needed immediate attention. SPVD, a disease caused by a synergistic interaction between the white fly-borne Sweetpotato Chlorotic Stunt Virus (SPCSV) and the aphid-borne Sweetpotato Feathery Mottle Virus (SPFMV), is a major threat to sweetpotato production particularly in Bukoba and Muleba districts. Various control techniques including use of resistant varieties and phytosanitation were considered and implemented through Farmer Field Schools (FFS) approach. In the current study the practical procedures on effective implementation of SPVD control techniques based on FFS approach have been explored. Socio-economic factors affecting adoption and farmers' responses to the FFS approach are indicated. Problems related to FFS in Kagera region are documented and solutions suggested.

Introduction

Sweetpotato, *Ipomea batatas* (L) Lam., is globally the second most economically important root crop after potato (Stather, 2003). It is widely grown in Africa for food and family income generation (Gibson *et al.*, 2002). In Tanzania, the crop is particularly grown by women around the homestead for food and cash in some areas (Kapinga *et al.*, 1995). It is an increasingly income earning crop for farmers close to urban centres in Kagera region. In a 2003 survey, the crop was ranked number one in almost all homesteads particularly in Bukoba district. The importance of sweetpotato as an alternative crop is attributed to low input requirements of the crop, short time to maturity and the ability of the crop to grow well in marginal lands. In addition, the decline in banana productivity due to pests (weevils and nematodes), diseases (panama, black sigatoka) and poor soil fertility makes sweetpotato the best alternative. Most soils in Kagera are dominated by highly weathered kaolinitic soils, characterised by relative enrichment of iron and aluminium hydroxide (Baijukya and Folmer, 1995). Combined with high leaching rate of the soil due to poor structure the effect transforms poor soil fertility problems into an acute one.

Despite the importance of sweetpotato in Kagera, lack of high yielding varieties as well as pests and diseases are the major constraints to its productivity (Rwegasira, 2003). The main disease affecting sweetpotato is sweetpotato virus disease (SPVD), caused by a synergistic interaction between the whitefly-borne (*Bemisia tabacai*), *Sweetpotato chlorotic stunt virus* (SPCSV)

and the aphid-borne *Sweetpotato feathery mottle virus* (SPFMV) (Gibson *et al.*, 1998). SPVD was reportedly wide spread in Bukoba (Gibson *et al.*, unpublished). The disease causes yield loss of between 56 – 98% (Gibson *et al.*, 1998, Karyeija *et al.*, 1998). There was therefore a need for immediate intervention to alleviate SPVD problems in the region. Various control techniques including use of resistant varieties and phytosanitation were considered and implemented through Farmers' Field School approach.

Farmer Field School (FFS) refer to the experiential learning approach meant to provide farmers with deeper understanding of crop ecology and observational, analytic and problem solving skills which help farmers evaluate the importance and applicability of their existing and innovative practices (Stather, 2003). It is a practice centred on formation of cohesive farmer groups, going through various problems they are facing and identifying possible solutions available. The objectives of the study were i) to assess the effectiveness of FFS in controlling SPVD in farmers' fields and ii) to identify constraints to FFS approach and possible solutions.

Materials and Methods

The preceding survey on SPVD problems in Kagera region by R. Gibson in March 2003, guided the identification of high disease pressure zones. To start with, six sites were identified in Bukoba district at Bugabo, Kanyigo (Nyungwe and Kikukwe), Kanazi, Kyaka and Kyema. These were selected on the basis of readiness of farmers to work in groups and on sweetpotato. Kanyigo, Kyaka and Kyema were the high SPVD pressure zones while Kanazi and Bugabo were the moderate to low SPVD pressure zones. Farmers were sensitised to form groups comprising of not less than 10 members but not more than 25 members. Each group selected their leadership (chairperson, secretary and treasurer) and also made a constitution to guide their decisions. A gap analysis was conducted with each farmer group to assess what farmers knew, what needed rectification and the whole range of perception of the SPVD problem.

Facilitators for the respective groups were identified through discussion between researchers and farmers. The agricultural extension officers for the respective areas where the FFS is based were seconded by farmers, and they willingly accepted to support the FFS. With emphasis on SPVD, the facilitators were trained on breeding, agronomy, plant protection and post-harvest aspects of sweetpotato, at Maruku Agricultural Research Institute. Thereafter, farmers and facilitators were trained at their respective fields on SPVD. Through FFS, farmers learnt by doing, the various SPVD control techniques. The use of SPVD-resistant varieties and phytosanitation (selection of healthy vines, roguing of SPVD affected plants and isolation) were the principal management techniques tried out by farmers.

Other agronomical and breeding aspects were also practised. Variety suitability criteria used on assessment were farmer-based. Exchange visits among the groups were conducted to allow each group learn from the other through free interactions. Finally a questionnaire was designed to enable farmers and facilitators evaluate the effectiveness of the learning approach they went through and give comments. A total of 97 farmers (in six groups) and four facilitators were interviewed. Farmers were interviewed as a whole group while facilitators were asked to fill in the questionnaire individually. All the responses were compiled to obtain a comprehensive feedback on FFS.

Results and Discussion

The effectiveness of FFS in controlling SPVD. The gap analysis revealed that most farmers knew very little about SPVD. On the contrary, they associated it with physiological disorder caused by drought and poor soil fertility. The 'hands on' strategy where by farmers learnt by doing, through field experiments that were designed to reflect what

they were trained on deepened their understanding. Farmers were able to plant various sweetpotato varieties and test their response to SPVD as well as insect pests, soil fertility and agro-ecologies. The different phytosanitation practices were effectively tried by farmers. Similar findings, as those reported by Gibson *et al*. (2002), were observed during this study that resistant varieties and phytosanitation practices reduced SPVD incidence to negligible levels. Farmers in each group observed and recorded variables they had initially considered important for final evaluation. These included number of sprouted plants, vigour, disease symptoms, insect pests, root setting time and the drought tolerance of the varieties (Table 1). The progress of infector plants incorporated as source of SPVD, new infection on healthy plants and presence of vectors such as whitefly (*Bemisia tabaci*) and aphids were noted. They discussed any strange observations amongst themselves and proposed possible solutions or sought for assistance from the facilitator and the researchers.

Exchange visits among farmer groups augmented their understanding ability. The visits allowed sharing of knowledge and experiences amongst the groups. Many questions about SPVD and dissemination of knowledge to the rest of the community were asked and answered. The sharing allowed different groups to identify gaps in their respective activities. Drama, laughter and songs composed to either entertain the guests or the hosts had clear message on the control of SPVD for increased food security. Increased farmers' awareness on SPVD was also reflected from the additional criteria that farmers used during the final evaluation of the different trials. The additional criteria include resistance to SPVD, pest damages and root flesh colour. These were considered along with the previously used criteria by farmers (Table 2).

The visitation to FFS members' fields revealed that they are already implementing SPVD control techniques they had learnt, particularly the phytosanitary ones. A total of 53 farmers (Table 3) were practising selection and roguing against SPVD in their own fields that translates to about 55% adoption. However, respondents felt that the number of adopters is small compared to what was expected. Farmers attributed this to the fact that only a few of them had planted sweetpotato after training on SPVD was done. They were optimistic that the number of adopters would have been higher if evaluation was conducted after the new planting season had started. This implies that the rate at which farmers adopt the respective technologies is fast when 'hands on' techniques are

Table 1: Various parameters looked at by the six groups.

Parameter	Farmer groups					
	Abate-kanasha	Jaribu	Juhudi-Lilalo	Neema	Twende na wakati	Umoja
Sprout count	Done	Done	Done	Done	Done	Done
Rouging SPVD affected	Done	Done	Done	Done	Done	Done
Plant vigour	Done	Done	Not done	Not done	Done	Done
SPVD symptoms	Done	Done	Done	Done	Done	Done
Defoliator pest	Done	Done	Not done	Not done	Not done	Not done
Number of diseased plants near infectors	Done	Done	Not done	Not done	Not done	Done
New SPVD infection	Done	Done	Done	Done	Done	Done
Presence of SPVD vector (Whitefly, Aphids)	Done	Not done	Not done	Not done	Not done	Not done
Root setting	Done	Not done	Done	Not done	Done	Not done
Drought stress	Not done	Done	Done	Done	Done	Not done
Vectors population	Done	Not done	Not done	Not done	Not done	Not done

Table 2: Criteria used to evaluate sweet potato varieties.

Criterion	Abate-kanasha	Jaribu	Juhudi-Lilalo	Neema	Twende na wakati	Umoja
A[1]: Yield	"	"	"	"	"	"
Long storability	"	"	"	"	"	"
Root size	"	"	"	"	"	"
Early maturity	"	"	"	"	"	"
Taste	"	"	"	"	"	"
Starchiness	"	"	"	"	"	"
Resistance to pests	"	"	"	"	"	"
B[2]: Resistance to SPVD	"	"	"	"	"	"
Root shape	"	"	"	"	"	"
Root flesh colour	"	"	"	X	X	"

[1]A = previously used criteria by farmers. [2]B = added (newly included) criteria on recent evaluation.

Table 3: Number of farmers controlling SPVD in their fields.

Group	Abate-kanasha	Jaribu	Juhudi-Lilalo	Neema	Twende na wakati	Umoja	Total
FFS group members	15	29	11	19	10	13	97
Selection of healthy plants and roguing	13	14	6	7	8	5	53
% Adoption	87	48.3	54.5	37	80	38.5	54.6

employed. Thus FFS offers farmers the effective opportunities to solve their own problems.

Generally, FFS - based SPVD control approach was found to be effective in all groups because the approach exploited the idea of farmer knowledge of their own problems and resources available in the surrounding environment. It promoted sense of unity, as a mechanism to track possible solutions to those problems through formation of groups.

Factors affecting FFS. Despite the observed effectiveness of the FFS approach, its full potential has not been realised due to various social, cultural, physical, and economic factors. Among them is false expectation among farmers at a time of group formation. Many farmers joined FFS expecting free funds, farm inputs and other fringe benefits without their efforts. On failing to meet their expectations a number of farmers left the FFS groups leading to a decline in membership compared to the numbers at the start. On the other hand the deserters created negative publicity to the rest of the community. This presented a social set back to the groups within the communities.

Culturally, sweetpotato is known as a crop for women in Kagera (Ndamugoba *et al.*, 2003). This cultural bias was maintained even during group formation in such away that many groups are largely composed of women (Table 4). This reduced freedom in decision making that led to difficulties in fulfilling most of the FFS plans. At the sametime, cultural division of roles and responsibilities affect FFS activities particularly in groups comprising women only.

The limited availability of arable land has also deterred the success of the approach. Customarily, only a few families own land and

Table 4: Problems that affected SPVD-FFS groups.

Parameter	Abate-kanasha		Jaribu		Juhudi-Lilalo		Neema		Twende na wakati		Umoja	
Sex	M[1]	F[2]	M	F	M	F	M	F	M	F	M	F
	0	15	10	19	0	11	0	17	4	6	0	13
Land scarcity	Yes		No		Yes		Yes		No		No	
Social events	Yes		Yes		Yes		Yes		Yes		Yes	
Lack of markets	Yes		Yes		Yes		Yes		Yes		Yes	
Lack of equipment / agric. input	Yes		Yes		Yes		Yes		Yes		Yes	
Low creativity	No		No		Yes		Yes		No		Yes	

[1]M=male, [2]F=female.

it is only men that decide on the use of a given piece of land. Very often, men give land preference to cash crops such as coffee (Baijukya and Folmer, 1995). Since sweetpotato is regarded as a women crop and most sweetpotato FFS groups were composed of women, access to the land was a problem. This made it difficult to implement some practices such as isolation in controlling SPVD.

Social events and behaviour affected the effectiveness of FFS. In most cases, farmers get involvement in other community responsibilities such as traditional ceremonies, meetings, church responsibilities and political gathering that highly reduced the performances. In addition, such attributes as low level of motivation to adopt new technologies, less participation in contributing to useful ideas, assumption of ideas and tendencies to leave others decide were recorded. These social aspects were found to be characteristics inherent of women in many groups that in turn affected the effectiveness of FFS approach.

False promises were found to limit the success of FFS. Records from previous experiences indicated that agents in various cadres including politicians, project co-ordinators etc, would encourage farmers to form the groups and use them to source funds only to abandon them after getting funds. This discouraged many farmers to join the FFS groups and in turn denied them benefits they would have realised.

Absence of market as a driving force to increased sweetpotato production affected the effectiveness of FFS. This leads to low price payable per agricultural commodity hence low income. Low-income farmers have less ability to purchase necessary equipment and inputs. Some farmers could not afford buying hand hoe and vines for improved varieties. However the low-income to sweetpotato producers seems to be caused by lack of creativity and low motivation to innovation of technologies that would add market value to their products. This was realised in some groups, where farmers feared possible losses of their sweetpotato flesh roots due to lack of markets. The fear emanated from bumper harvests they expected and the easy perishability of flesh root. This probably dictates the need for rising sense of creativity, identify reliable market, good information linkages and FFS-based training on post-harvest technologies, which targets at adding value to sweetpotato products.

Possible solutions to FFS problem. Many suggestions were given as solutions to FFS problems. Respondents indicated that, most socio-cultural problems could be solved through formation of gender balanced FFS groups. This is based on the fact that most decisions would often involve resources, which are afforded by men. Decisions on such issues as land, inputs, time to be spent on group activities, and participation in exchange

visits are all dependent on authorisation from men in households. Involvement of leadership at all appropriate levels would help solve some of the problems including land shortage, venues for meeting and excuse from participating in some activities that would otherwise interfere with FFS schedules. Simple affordable technologies that are appropriate to farmer environment will strengthen FFS. Well-constructed constitutions to defend groups' interests may help consolidate the already established groups and foster the usefulness of FFS approach. Establishment of sweetpotato network from village, ward, division, district, region to the national levels would help with information sharing and easy access to resources and available opportunities.

Conclusion and Recommendations

Through FFS, farmers' circumstances and priority problems facing sweetpotato such as SPVD were easily identified. Proper implementation of FFS imparted sense of ownership and full responsibility of farmers to SPVD management and related technologies that were meant to assist them solve their problems in a practical way. Research about SPVD and transfer of technology were easily implemented while taking care of farmer needs, which allow for exploitation of affordable and cheaply available solutions to farmer problems. The SPVD control strategies developed taking into consideration farmers' circumstances and priorities become sustainable as farmers easily emulated them in their own fields. All these indicate that FFS approach is effective in solving farmers' problems provided that farmers are well guided.

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