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Farmers' perceptions of pests and pesticide usage in Masaka district, Uganda

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Abstract

A random sample of 60 semi-commercial farmers selected in Masaka district, Uganda, from six counties were interviewed to investigate their perceptions of pesticide usage and pests of crops and animals. The banana weevil, *Cosmopolites sordidus* (Germar) (Coleoptera: Curculionidae) and nematodes were reported to be the worst pests for the banana (*Musa* spp.) crop, while the maize stalk borer, *Busseola fusca* Fuller (Lepidoptera: Noctuidae) was reported to be the major pest of maize *(Zea maydis)*. Many farmers felt that the insecticides they use are sufficiently effective against the pests, the only issue being one of availability. Non-chemical methods of pest control employed in this area include good crop husbandry, like destruction of crop residues after harvest. Only a few farmers were aware of the role of biological control and the significance of weeding in crop pest management.

Key words: Agricultural chemicals, integrated pest management, semi-commercial farmers

Introduction

To meet the food needs for growing populations, many pesticides are currently applied to large areas for crop and animal production in developing countries resulting in the pollution of food, air, water and soil (Edwards, 1983). It has become evident in recent years that the use of pesticides may have harmful effects on the flora and fauna in and around areas where the pesticides are used. Pesticides have adverse effects on the biological agents of the pest whose eradication is desired, thus resulting in a rise of pest population (Pimental and Edwards, 1982; Edwards, 1987; Freemantle, 1993). The rise in the pest population then necessitates a more intensive use of pesticides in quantities that are appropriate.

The use of chemical pesticides for agricultural production in Uganda has been growing steadily for the last few decades (Tukahirwa, 1991). It has been estimated that over 1 million kilograms of pesticides are presently used in Uganda annually (Tukahirwa, 1991). The increasing rise in pesticide usage in Uganda was also reported by Bazirake (1993). Moreover, pesticides are increasingly considered indispensable tools in Uganda's agriculture (Tukahirwa, 1984), despite the growing concern about their adverse effects on humans and the environment.

Sole reliance on pesticides not only fails to provide permanent control of pests and diseases, but also increases problems in agro-ecosystems (Metcalf, 1980; Flint and Van den Bosch, 1981; Tait, 1983; Dent, 1991;). There are reports of deleterious effects of pesticides on invertebrate population on farms where pesticides have been used intensively for many years in Uganda (Kizito, 1989; Tinzaara, 1994). This behavior could also result in negative consequences, such as the development of resistance by pests against the chemicals. Furthermore, the low levels of education of farmers may also exacerbate

environmental and/or ecological damage by chemicals, mainly through excessive application. The farmers' safety is also jeopardized by poor handling of these chemicals which can lead to poisoning, and in severe cases, death. Thus, although pesticide chemicals are valuable to smallscale farmers, there is need to integrate other methods of control with judicious use of these chemicals, to minimise pesticide overuse.

In a survey conducted in Uganda (Gold *et al.*, 1993) in the banana cropping system, farmers reported that they would be willing to use pesticides but are limited by the high costs and lack of information on how to use insecticides. However, it was reported that a number of the same farmers applied chemicals to horticultural and other annual crops, suggesting that insecticide use was more a question of economics than information.

Therefore, the study was conducted to identify what farmers perceive as their most serious pest problems, determine the extent of pesticide usage and to assess level of awareness with regard to the potential hazards of the chemicals. It is hoped that the data generated will contribute to the design and development of a farmers' awareness training programme of pesticide usage, to ensure that the amounts and toxicities of pesticides used are in accordance to the guidance of the concerned extension staff and for adoption of IPM concepts.

Materials and methods

A survey was conducted in Masaka district from October 1994 to May 1995. Masaka district is located between longitudes 31° 45'E and 32° E and latitudes 0° 20'S and 0°21'S, and the area experiences a bimodal rainfall regime, with the rains falling from March to May, and September to November. Consequently there is continued agricultural activity for most of the year, which may lead to enhanced application of pesticides by the farmers. The major crops grown in the district are bananas, coffee, maize, and beans.

Interviews were conducted in six counties that included Mawogola, Bukoto, Kalungu, Lwemiyaga, Bukomansimbi and Masaka Municipality. In each county, a random sample of 10 farmers was taken from a list of farmers provided by the local agricultural extension officers. All 60 farmers were interviewed using a structured questionnaire. To minimise bias, the questions were interactive and open ended, rather than asking the farmers to select an answer among fixed choices. The questionnaire was first pretested and adjustments made accordingly. The local Agricultural extension Officers in their respective areas assisted in arranging the meetings. After covering basic information and type of crops grown, the questions focused on crop/animal production constraints, pests, pesticides used and other pest control methods. The interview was concluded with naming and describing common arthropods by farmers to assess their pest knowledge base. Samples of the arthropods were placed in vials containing 70% alcohol and taken for identification at Zoology Insect Museum, Makerere University. The questionaire was also designed to capture information on the kinds of weeds and herbicides used on individual farms.

Results

Farmers' perception of pests

All farmers reported that their crops suffer from various insect pest problems (Table 1). Majority of farmers interviewed identified the banana weevil (86.5%) and nematodes (18.0%) as the most common pests of banana, and were able to give descriptions of their feeding habits and the type of damage they cause. Some farmers reported weevil damage symptoms ranging from reduced bunch size on individual plants, to loss of entire fields through toppling or failure of stools to reproduce. It was, however, difficult for farmers to distinguish uprooting which is commonly attributed to nematode damage, from snapping believed to be caused by weevils (Feakin, 1977; Stover and Simmonds, 1987; Sarah, 1989). Quite often damage symptoms caused by diseases such as *Fusarium* wilt and Black

sigatoka, or even soil deficiencies, were attributed to weevils. The black ant *Odontomachus tryglodytes* was reported to be a pest of bananas in that it tunnels at the base of the plant and exposes roots.

Farmers (57.4%) reported serious problems and infestation of maize by stalk borers (*Busseola fusca)* and were also able to give accurate descriptions of their feeding habits and the type of damage they caused. Farmers' knowledge of other insect pests of other crops was however, much more limited, though most farmers acknowledged that pests pose great losses to crop production.

Extent of pesticide usage

Most farmers acknowledged the use of pesticides to control insect pests on their crops. When farmers were asked to name the pesticides used, the information given was sketchy mainly because they kept no farm records. The pesticides currently used by farmers are presented in Table 2.

Most farmers (81.7%) reported that they do usually achieve reduction in damage to crops through the use of pesticides. Farmers were nostalgic about the use of pesticides like Dieldrin, DDT and Aldrin, but expressed different reasons for discontinued use of the chemicals. The reasons included: the pesticides are no longer effective (34.4%); pesticide banned from use (3.0%); or a pesticide environment degradation (16.4%). A few farmers who did not use any pesticides on their crops said they could not afford the cost.

There is a general belief among farmers that pesticides are considered the best tool in crop protection. The effectiveness of pesticides was highly perceived by farmers, which presumably encouraged more of them into adoption of pesticide usage. All farmers freely responded that pesticide application increases yield. More than 40.0% of the farmers asserted that pesticide usage increases crop yields by 50.0% or more. With this view by the farmers, it is clear that the trend for usage of pesticides will increase.

When farmers were questioned about the timing of spray, 34.0% said that they spray as soon as they notice an infestation or when the extension officer in charge advises them to spray. Fifty percent (50.0%) of the farmers reported that routine spraying is done to crops like maize, beans and tomatoes, with different rates as shown in Table 3. Most banana farmers reported that they apply chemicals every after weeding and desuckering, while others apply chemicals every rainy season. Cattle were dipped or sprayed routinely about once per fortnight.

Table 1.Common arthropod pests of crops and animals reported by farmers in Masaka district.

Crop/animal	Common/scientific name	Respondents (%)	Ranking
Banana (n=57)	Banana weevil (*Cosmopolites sordidus*)	88.5	1
	Nematodes	18.0	2
	Ants	1.6	3
Beans (n=60)	American bollworm (*Heliothis armigera*)	6.6	1
	Black bean aphid *(Aphis fabae)*	3.6	2
Coffee (n=38)	Coffee berry disease (*Hypothenemus hampii*)	29.4	1
	Ant	14.8	2
	Antestia bugs*(Antestiopsis* spp.*)*	4.8	3
Maize (n=60)	Maize stalk borer *(Busseola fusca*)	57.4	1
	Cutworms (*Agrotis* spp.*)*	9.8	2
Cattle (n=23)	Ticks	92.4	1
	Tse tse flies	4.8	2

n= number of farmers responding.

Farmers reported different frequencies of pesticide application to crops and animals (Table 4). Few farmers apply rates as recommended by manufacturers or as guided by the extension staff. However, even those farmers who sprayed more than the recommended times did realise that the extra applications do not necessarily lead to overall increase in yield. Some farmers, however, admit that they lack information on the recommended rate of pesticide applications to crops/animals, and the side effects of the pesticides.

Farmers (78.7%) followed instructions given on the pesticide containers by the manufacturers to determine the amount to add to a sprayer. Other farmers (9.8%) are guided by agricultural extension staff, while a few others (4.9%) do not clearly know what to do.

Table 2. Pesticides presently used by farmers in Masaka district for a given crop/animal.

Crop/animal	Trade name	Active ingredient	Respondents (%)
Banana (n=60)	Furadan	Carbofuran	67.2
	Marshal	Carbosulfan	1.6
	Primicid	Pirimiphos-ethyl	6.6
	Ambush	Cypermethrin	1.6
	†Local insecticide		1.6
Maize (n=60)	Ambush	Cypermethrin	49.2
	Salut		14.2
	Dithane M-45	Mancozeb	1.6
	Sumithion	Fenitrothion	4.9
Coffee (n=60)	Ambush	Cypermethrin	50.0
	Sumithion	Fenitrothion	3.3
Beans (n=60)	Salut		13.1
	Sumithion	Fenitrothion	4.9
Cattle (n=23)	Supona	Clorfenvinphos	37.7
	Piglease		8.2
	Steledone		3.3
	Spoton		6.6
	Nilzan		6.6
	Decatix		4.4

† = Mixture of ashe, pepper (*Capsicum spp*) and cattle urine.

Table 3. Farmers' frequency of pesticide application to crops and animals in Masaka district.

Frequency	% farmers responses					
	Furadan	Ambush		Salut		Supona
	Banana (n=40)	Maize (n=30)	Coffee (n=14)	Beans (n=8)	Maize (n=9)	Cattle (n=23)
More than once a week	-	8.2	-	-	-	5.1
Once a week	-	14.3	5.8	15.6	9.8	69.7
More than once a month	-	-	52.7	49.8	49.8	24.3
Once a season	8.1	77.6	38.1	40.4	39.3	-
Three times a year	18.3	-	3.4	-	-	-
Once a year	73.6	-	-	-	-	-

Farmers appear to be conscious of the dangers of most pesticides. Eighty percent (80%) of the farmers do not normally mix more than "the usual amounts" when the pest problem is worse than normal, the reason given being fear to overdose plants/animals. Furthermore, a majority of farmers (78.7%) indicated the need for skills before one could properly spray. In this area, the farmers either hire a professional sprayer or spray the pesticide themselves. Farmers who spray usually own themselves Knapsack Sprayer and enough household labour. Contracted sprayers usually have their spraying machines, and are responsible for pesticide mixing. In the latter case, farm owners provide all the pesticides (herbicides or insecticides) to cover the land area agreed upon.

However, farmers lacked proper education on the hazards of the chemicals and the correct methods of spraying. Regarding agricultural risk factors, 90.0% of the farmers used liquid formulations, 62.0% applied pesticides in mornings, while 37.0% considered wind (strength and direction) obstractions irrespective of the time of day. Twelve percent (12.0%) of the farmers used boots or gloves and 42.0% wore face masks in form of handkerchiefs as protective clothing. This however, provides minimal protection and may instead increase risk. With regard to personal habits and practices, 88.0% changed clothes, while 74.0% took showers after pesticide application. However, some farmers (5.0%) ate and 8.0% smoked while applying pesticides.

Other pest management practices

Crop resistance

Crop resistance is not clearly understood by farmers as an important component of pest management. Despite the lack of knowledge, some farmers especially for the banana crop could name some banana cultivars which have varying degrees of resistance to weevil damage. Ndiizi (AB genome group) and

Table 4. Farmers' ranking of weeds common in their fields (crops) in Masaka district.

Crop	Weed name	% farmer responses			
		Most serious		Least serious	
		1	2	3	4
Banana (n=60)	*Bidens pilosa*	29.5	34.1	25.0	11.4
	Digitaria scalanum	17.6	58.8	17.8	5.9
	Lantana camara	15.2	10.8	43.5	30.4
	Commelina spp.	29.4	47.7	9.5	4.8
	Oxalis spp.	21.3	3.3	-	-
Maize (n=60)	*Bidens pilosa*	42.3	30.1	23.1	3.8
	Digitaria scalanum	54.3	27.3	9.1	9.8
	Lantana camara	15.0	-	60.0	25.0
	Commelina spp.	38.1	47.0	9.5	4.8
	Oxalis spp.	-	100.0	-	-
Coffee (n=38)	*Bidens pilosa*	31.8	13.6	36.4	18.2
	Digitaria scalanum	47.6	23.8	23.8	4.8
	Lantana camara	10.5	26.3	31.6	31.6
	Commelina spp.	25.0	56.3	12.5	6.3
	Oxalis spp.	83.3	16.7	-	-
Beans (n=60)	*Bidens pilosa*	57.1	23.8	9.5	4.8
	Digitaria scalanum	40.0	40.0	20.8	-
	Lantana camara	36.7	20.0	53.3	20.0
	Commelina spp.	46.2	46.2	7.7	-
	Oxalis spp.	60.0	40.0	-	-

Bogoya (AAA) cultivars, for example, were named by farmers as having higher resistance, compared to other cultivars. Farmers were apparently not so well aware of resistant varieties of other crops, probably indicating that this area relied on bananas as a major staple food crop.

Biological control

Farmers (44.0%) were aware of beneficial insects in the cropping systems. Some farmers reported black ants (*Odontomachus tryglodytes*) as predators of the banana weevil, while other farmers (12.5%) reported that ants repel *Antestia* bugs from coffee plantations. All farmers are apparently not aware of the role of insect parasites and fungal pathogens in reducing insect pest infestations.

Cultural control

Farmers employ a number of cultural control practices against crop pests, and are aware that pests reside in the crop residues. From the survey, 66% of the farmers interviewed indicated that maintaining clean farms helps to control pests and diseases. Cultural practices like weeding, pruning and mulching are practiced by farmers even though their role in pest management is apparently not so clear to them. They do all these things under the general framework of crop husbandry.

Traditional pest control practices

Traditional methods of pest control are not wide-spread in Masaka district. A few farmers use the "traditional insecticide" made by mixing ashes, red pepper (*capsicum sp*) and cattle urine and applied by spreading it around banana stools. Some farmers, especially for banana (54.0%) indicated that they practice trapping and hand picking of weevils. Hand picking of weevils is less effective even though 52.5% of farmers recognised it reduced pest numbers.

Extent of herbicide usage

The weeds that are common on farms in Masaka district are presented in (Table 4). Farmers generally consider weeds one of the constraints of production. *Digitaria scalanum, Bidens pilosa, Commelina spp* and *Oxalis spp* were reported to be the most common and serious weeds in all crops. Other weeds, but of less seriousness include *Lantana camara* and *Eurphobia* spp.

Some farmers (13.0%) were aware of the importance of weed control in insect pest management by reducing alternative host plants and shelter for pests. Farmers indicated that weed control increased crop yields. Most farmers reported that effective weed control increased yields by an average of 60.0%. Hand-hoeing was a commonly reported method of weed control, but herbicides are also in use. Gramoxone (Paraquat) and Roundup (Glyphosate) were the most commonly used herbicides (Table 5). It was reported by majority of farmers that herbicides are used when the weeds are intense, especially after the rainy season and/or when manual labour is scarce.

Constraints to crop and animal production

Table 6 summarises the various constraints to production. According to the survey, pests and lack of agrochemical are the major constraints to production for both crops and animals. Drought, labour, weeds, transport, and availability of market were among the less serious constraints to farming. This implies that farmers were likely to use lots of pesticides, despite the limited knowledge of how to properly apply them.

Discussion

The results suggest that most farmers in Uganda and Masaka district in particular, generally believe that pesticides are the best tool in crop and animal production. These farmers will continue to use pesticides unless persuaded otherwise because pesticides have an immediate knock-off effect.

The recommended number of applications and the required dosages are still not clear to some farmers. Some farmers do not follow instructions as recommended by pesticide manufacturers or as advised by extension staff. Such behavior is likely to result in development of resistance by pests, which consequently leads to use of yet more pesticides. Excessive application of pesticides also leads to damage of natural enemies populations (Pimental and Edwards, 1982; Edwards, 1987; Dent, 1991). In addition, farmers apply pesticides in a manner that disregards agricultural risk factors and without considering personal safety. Such behavior ultimately has disastrous impacts to human health, leading to poisoning and death.

Farmers in Uganda seem to overestimate and attach great importance to pest losses. Pesticides are considered as the panacea to all pest problems. The implication here is that farmers are likely to continue using lots of pesticides despite the limitations on their knowledge of how to properly apply them and the likely disastrous consequences to human health and the agro-ecosystems. In this regard, farmers need to be sensitised to adopt the IPM approach which is a better strategy for controlling pests.

Table 5. Number of farmers that use herbicides to control weeds in crops.

Herbicide	Crop	Herbicides users
Gramoxone (Paraquat)	Banana	36
	Coffee	23
	Maize	6
	Beans	12
	All crops	12
Roundup (Glyphosate)	Banana	14
	Coffee	21
	Maize	8
	Beans	4
	All crops	17
Stompu (Pendimethalin)	Maize	5
	Beans	6
	All crops	6

Table 6. Number of farmers naming constraints to production of crops and animals.

Constraint	Farmers responding				
	Banana (n=60)	Maize (n=60)	Coffee (n=38)	Beans (n=60)	Cattle (n=60)
Pest (insects)	19	12	3	9	4
Weeds	7	5	5	2	-
Drought	8	7	4	7	3
Agrochemicals	37	2	13	7	3
Land shortage	3	1	-	-	2
Labour	10	9	6	8	4
Transport	11	1	7	4	1
Poor soils	3	-	-	-	-
Market	5	1	3	2	-
Diseases	3	-	-	-	2
Information	3	-	3	-	-

However, adoption of IPM requires knowledge of the bionomics and ecology of the pest (Bottenberg, 1995; Smit and Matengo, 1995; Tukahirwa, 1991).

In a nut shell, the survey revealed that the problems of crop production are overwhelming many farmers in Masaka district, particularly the pests. The attitudes of farmers and grass root extension staff in Uganda are still in favour of pesticide application for pest and weed management. However, because of envisaged negative ecological impacts of most of these chemicals there is need to integrate other methods of control with judicious use of chemical pesticides. There is need to design an education and awareness programme for farmers to help them adopt better and more environment friendly pest management practices. Farmer education should focus on filling the gaps in indigenous knowledge concerning pest relationships, the proper use of chemical pesticides, the role of natural enemies, and importance of non-chemical control.

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