Pesticides in Ethiopian Agriculture: A Researcher's View

Tsedeke Abate
Institute of Agricultural Research
Nazareth Research Centre
P.O. Box 436, Nazareth, Ethiopia

Abstract

Ethiopia's annual pesticide purchases amount to more than 3,000 metric tons, valued at nearly US$ 20 million. Insecticides, herbicides, fungicides, and rodenticides and others constitute roughly 71, 25, 3, and 1 percent, respectively. The state sector is the main user of pesticides in this country. The bulk of pesticide use in the smallholder private sector is accounted for by insecticides used against the African armyworm (*Spodoptera exempta*) and locusts (*Schistocerca gregaria* and *Locusta migratoria*) averaging about 124 and 79 metric tons, respectively, during outbreak or plague years. The lack of pesticide regulation until recent years has resulted in the importation and use of some pesticides that are either banned, restricted or not registered in other countries. Also, it was not uncommon in Ethiopia for pesticides that have not been tested at all to be recommended against certain pests. Research on pesticide use in Ethiopia focused on screening of conventional synthetic pesticides; little or no information is available on non-conventional pesticides such as biopesticides and growth regulators. No work has ever been done on environmental impacts of pesticides. Economic and environmental concerns associated with pesticides make it unsustainable for pesticide use in smallholder agriculture and therefore pest management in food crop production systems in Ethiopia will rely on an IPM approach that will maximize cultural practices, natural biological control, and use of host plant resistance. It is suggested that future pesticide research should focus on the development of alternatives to conventional pesticides (such as botanicals and microbial control agents). Conventional pesticides may constitute an important component of IPM in commercial agriculture and high value crops; research here should give attention to pesticides that are compatible with IPM programs.

Introduction

As in many developing countries in Africa and elsewhere, agriculture plays a key role in Ethiopia's economy and the livelihood of its people. Agriculture provides employment for more than 80 percent of this country's population and contributes to nearly 50 percent of its gross domestic product. Although the country has a huge potential to develop its agriculture, it has remained food-deficit for more than two decades now. This condition has often been attributed to the lack of improved technologies - crop varieties, pest management practices, fertilizers, etc.

Recognizing the need for improving agricultural productivity in Ethiopia, institutions dealing with agricultural research, education, and extension have been established over the last three decades or so. These institutions have been engaged in developing crop production and protection packages. Research on pesticides was given a prominent consideration especially during the 1970s and early 1980s. This paper reviews the status of research on agricultural pesticides over the years in Ethiopia, their use and future prospects.

Pesticide Regulation

A detailed review of pesticide regulation in Ethiopia can be found in Gordon et al. (1995). The "Pesticide Registration and Control Council of State Special Decree No. 20/1990" of the Government of Ethiopia prohibits the manufacture, import, sale or use of any pesticide not registered in accordance with the Special Decree. This decree further states that "Notwithstanding registration, a pesticide may not be imported, stored, transported or offered for sale where not packed or labelled as provided in this Special Decree and directives issued hereunder." The Special Decree assigned the overall pesticide registration and control responsibilities to MOA. In addition, a National Pesticide Registration Advisory Committee (NPRAC) consisting of specialists from MOA,

the Institute of Agricultural Research (IAR), the Environment Protection Agency, Ministry of Health, and the Ethiopian Standards Agency has been established to advise MOA on issues related to the implementation of the Special Decree.

Before the issuance of the 1990 Special Decree, Ethiopia did not register pesticides. Until recently therefore it was not uncommon for pesticides whose use is restricted in industrialized countries to be widely used without restrictions in Ethiopia (see Table 1). There have also been incidents where pesticides that have not been tested were used against certain pests until very recently (Gordon et al. 1995). Although it was possible to effect pesticide registration *per se*, it is not uncommon to see pesticide repackaging by merchants and small pesticide dealers to this date. It should be noted here that NPRAC is still facing difficulties in terms of experience, trained personnel, and facilities to implement pesticide regulations.

To date, registration of only one pesticide has been officially denied by the NPRAC in this country although 16 African countries (Benin, Burkina Faso, Cameroon, Chad, Egypt, Ivory Coast, Kenya, Madagascar, Mauritania, Mauritius, Mozambique, South Africa, Sudan, Togo, Zambia, and Zimbabwe) have officially restricted, banned or withdrawn use of the so-called dirty-dozen and other hazardous pesticides (Table 2).

Table 1. Examples of restricted use pesticides (RUPs) in other countries, but not restricted in Ethiopia

Common name	Trade name(s)	Use pattern
Insecticide		
Aldicarb	Temik	Vegetables,
Amitraz	Mitac, Taktic	cotton
Azinphos-methyl	Guthion	Cotton
Carbofuran	Furadan	Cotton
Chlorpyrifos	Dursban	Vegetables
Cyhalothrin	Karate	Cotton, locusts
Cypermethrin	Cymbush	Wide range
Fenitrothion	Sumithion	Wide range
Fenthion	Lebaycid	Locusts, birds
Fenvalerate	Pydrin	Cotton
Lambda cyhalothrin	Karate	Wide range
Methamidophos	Tamaron,	Wide range
Methidathion	Monitor	Wide range
Phosphamidon	Ultracide	Citrus
Profenophos	Dimecron	Cotton
	Curacron	Cotton
Herbicide		
Alachlor	Lasso	Cereals
Atrazine	Atrazine	(broadleaf)
Cyanazine	Bladex	Same as above
Paraquat	Gramoxone,	Same as above
	Prelude	Cereals
Fungicide		
Chlorothalonil	Bravo	Wide range
Rodenticide		
Chlorophacinone	Rozol	Rats
Zinc phosphide	Zinc phosphide	Rats
Fumigant		
Aluminum phosphide	Detia	Stored products
Methyl bromide	Meth-O-Gas	Stored products

Source: RUPs status (Schulze 1995).

Table 2. "Dirty-dozen" chemicals and number of countries that have banned, severely restricted, or unregistered their use

Dirty-dozen	Use status*			
	1	2	3	Total
Aldicarb	13	9	11	33
Camphechlor	49	5	13	67
Chlordane	47	14	6	67
Heptachlor	52	7	9	68
Chlordimeform	31	3	21	55
DBCP	30	2	22	54
DDT	49	23	6	78
Aldrin	59	9	7	75
Dieldrin	67	9	6	82
Endrin	58	5	13	76
EDB	34	3	16	53
HCH (BHC)	52	8	10	70
Lindane	28	17	1	46
Paraquat	9	7	4	20
Parathion	25	5	10	40
Methyl-parathion	14	7	13	34
Pentachlorophenol	27	14	15	56
2,4,5-T	45	1	16	62

*1=banned; 2=severely restricted; 3=unregistered.
Source: adapted from PAN North America (1995).

Traditionally, IAR and academic institutions such as the Alemaya University of Agriculture, and the Awassa College of Agriculture are responsible for conducting small scale screening trials to determine the efficacy of various pesticides. Large scale verification trials may be done either by IAR and academic institutions or by the Research and Advisory Department of the then Ministry of State Farms, Coffee and Tea Development. The Arsi Regional Development Unit used to conduct experiments mainly on herbicides and fungicides for use in its project areas. The Shola Plant Protection Laboratory of the Ministry of Agriculture conducts pesticide experiments against migratory pests (armyworm, locusts, birds) and vertebrate pests in certain areas of the country. The Desert Locust Control Organization for Eastern Africa, with its headquarters in Ethiopia, has its own pesticide importation and testing protocol.

Pesticide Research

Concerted efforts on pesticide research in Ethiopia started towards the early 1970s. These included screening of insecticides, fungicides, and herbicides. Recommendations on pesticide use have been made (Crowe & Shitaye 1977) based on the results of screening trials. Some work on screening of rodenticides was also initiated around the mid 1970s at the Holetta Research Center of IAR and some results were obtained (Getachew 1979, Abebe 1986).

Pesticide research in Ethiopia concentrated on conventional synthetic pesticides; little emphasis was given to research and development on other groups of pesticides such as botanicals, microbial agents, growth regulators, or pheromones, at least until recent years.

Botanicals

The earliest attempts to use botanicals in pest control in Ethiopia date back to the mid 1970s when entomologists at the Holetta Research Center of IAR tried to develop home made extracts of pyrethrum. Extracts were made from dried mature flowers using benzine; extracts of lemon grass were added to improve the smell of the product. This was used to control household insects around Holetta. No further follow up was made along this line.

Neem seed powder was also tested around the same period against stored maize pests in the Gambella area. Interest in botanicals increased

Table 4. Pesticide usage (kg or l) by the state farms (average for 1988-1992)

Crop	Pesticide Group*				Total
	I	H	F	R	
Cotton	842,942	5,478	7,902	272	856,594
Cereals	47,395	285,772	45,128	9,772	388,067
Citrus	28,245	6,846	12,402	0	47,493
Vegetables	16,500	0	28,445	12	44,957
Mustard	3,800	3,648	0	0	7,448
Tobacco	2,950	0	0	0	2,956
Pulses	0	1,860	0	0	1,860
Grapes	0	0	360	0	360
Total	941,838	303,604	94,237	10,056	1,349,735
Percent	69.8	22.5	7.0	0.7	100.0

I=insecticide, H=herbicide, F=fungicide, R=rodenticide
Source: Gordon et al. (1995).

Discussion

The future of pesticides in Ethiopian agriculture will depend upon the type of agricultural systems. That is, whether the existing small scale agriculture which currently accounts for more than 95% of food production will continue to dominate or whether large scale commercial agriculture will grow at a rapid rate to replace the existing systems. It should also be noted here that there will be agriculture in transition, where the current initiatives to increase food production and productivity will result in the intensification of the currently cultivated land and expansion into new areas, areas that have not been exposed to human encroachment hitherto.

The agricultural systems in small scale production in Ethiopia are characterized by complexity and diversity such that pest outbreaks on the magnitude known in commercial agriculture are rare (except for migratory pests) and therefore conventional pesticides will have little or no role under such systems. There are clear indications that pesticide application in small scale production systems may not be justified as long as proper cultural practices are followed.

It is possible that agriculture in transition and commercial agriculture will depend on judicious use of pesticides. However, there should be a justification for pesticide use—do we really need to apply pesticides for the sake of applying or do we have enough information about the amount of crop loss attributed to pests.

In conclusion, economic and environmental concerns associated with pesticides make it unsustainable for pesticide use in smallholder agriculture and therefore pest management in food crop production systems in Ethiopia will rely on an IPM approach that will maximize cultural practices, natural biological control, and use of host plant resistance. Future pesticide research should focus on the development of alternatives to conventional pesticides. Pesticides may constitute an important component of IPM in commercial agriculture and high value crops; research here should give attention to pesticides that are compatible with IPM programs.

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