UNITED NATIONS
DEVELOPMENT PROGRAMME

EMERGENCIES UNIT FOR
ETHIOPIA (UNDP-EUE)

SECTION ONE:
Status of the Armyworm Outbreak in Ethiopia in 1996 and Considerations for Forecasting Migrations

By Dr. Robert Shank, Field Officer, UNDP - Emergencies Unit for Ethiopia, June 1996

Biology and Epidemiology

The African armyworm is the larval stage of the night flying moth, *Spodoptera exempta*. The larvae or caterpillar, when occurring in large numbers, can consume rangeland grasses or wheat, barley, teff, maize, sorghum or finger millet crops faster than 400 head of cattle per hectare. After molting through six stages or instars over 14-22 days, the larvae pupate in the soil to emerge as moths which reinfest at the same place or several hundred kilometers downwind.

The seasonal cycle of the armyworm begins with the low density breeding of dry-season populations in the cool, coastal highlands of Kenya and Tanzania. These small populations of the solitary phase, which do little crop damage, occur in scattered grassy areas where it is not economical to spray or control them. As the Inter-Tropical Convergence Zone (ITCZ) begins moving northward causing the annual onset of the *meher* rains, strong winds accompanying the thunderstorms carry some moths to the interior highlands where primary outbreaks occur. Although not fully understood, it is here that the biological mechanism whereby a solitary pest transforms into the 40 times more active gregarious form takes place. It is thought that climatic changes at the onset of the rainy season, particularly when following a drought season, result in production of abundant forage which may trigger some response in the females laying the eggs. Because each female can lay 800-1000 eggs, as few as 30 moths could cause a serious outbreak of 15 million armyworms within two generations or two months.

1996 outbreaks and control measures

A small outbreak of the African armyworm that developed in Konso special wereda of the Southern Nations, Nationalities Regional State in late April was quickly controlled. However, early May reports of 2,070 hectares of cropland affected in Borena zone of the Oromiya Region was soon followed by reports of 5,084 hectares of cropland affected in Bale zone, 8,185 hectares in East Hararghe zone (Oromiya Region) and 16,453 hectares in 3 zones of Somali Region. Smaller outbreaks are currently being reported in North Shewa, North and South Welo zones of the Amhara Region and Tigray. Although chemicals were available and cropland control was implemented (Table 1), large areas of grassland were also affected. In the grassland areas the larvae were allowed to pupate in the ground, which could result in secondary outbreaks in about a month. Two questions arising that could have important implications for Ethiopia are: when and where are secondary outbreaks likely to occur? and where did the armyworm moths come from, since Kenya has reported no outbreaks?

Using the data from the armyworm Pheromone moth traps, it is possible to back track the arrival of the moth with the meteorological phenomenon which occurred at the time. Trapped moth numbers for several locations in Oromiya and Somali Regions show that armyworm moth migrations to the area occurred around May 9-11 (Table 2). Normally migrations originate on the

Tanzania/Kenya border and proceeds northward. However, DLCO-Nairobi reported no outbreaks this year and the question remains as to where the initial insect multiplication occurred. Armyworm populations propagate in the solitary stage in grassy areas where rainfall permits vegetation throughout the year - conditions such as these exist along Somali coastal areas and a few irrigated or areas of Ethiopia receiving frequent rainfall.

Strong air currents and rainfall inciting weather patterns during this time indicate that the source of armyworm infestations was likely to be south-western Ethiopia (Figure 1), not the Somali coastline. A strong storm occurred on May 9 with accompanying winds of 72 km/hr from the south-west. If moths had originated from the Somali coast they could not have crossed these wind systems. South-western bound winds with occasional rain continued through the month of May and into June with the strong anti-cyclone system in the Indian Ocean. (Figure 2). It is possible that favourable rainfall in late 1995 and early 1996 in south-west Ethiopia allowed buildup of solitary numbers of armyworm which turned gregarious with the arrival of Belg rains. This is the probable cause of the large numbers of moths trapped in Awassa, adjacent to Wendo Genet, and may be an indication of future problems should large areas of south-west Ethiopia come under irrigation, for example in the Weyto rivershed and around Arba Minch.

With regard to the forecast of future outbreaks, meterological observations indicate that south-western winds are likely to continue into the first *dekad* of July bring above average rainfall to the southern escarpments of the Hararghe mountains and Jigjiga plains (Figure 3). This is likely to prevent moth migrations from crossing the Rift Valley but could result in recurring outbreaks in these areas as well as northern Somaliland and the coast of Yemen. Pupae numbers, which are high in grassland areas, could be reduced by cool rainy weather but also are presently sufficient to result in large moth hatches if rainy periods were punctuated by warm sunny days. Also the outbreaks on grasslands of North Shewa, North and South Welo (Amhara Region) could be sufficient to incite secondary outbreaks in those areas and further north since sufficient crop and vegetative growth are present. Plantings of crops this year do not follow the usual schedule, since rainfall as early as December in northern areas sparked some planting, whereas normally planting would begin in May or July depending on soil moisture. This has provided crops and grasses at all stages to allow breeding areas for the armyworm at the same time. The movement of the Inter-Tropical Convergence Zone into northern Ethiopia in late June and early July normally brings the armyworm along with the planting rains. This is not to say that large areas of Ethiopia that have yet to be planted will be susceptible to armyworm damage should migration occur when *meher* rainfall and crop emergence occur.

Table 2. Summary data on armyworm outbreak in Ethiopia up to June 10, 1996.

Location	Outbreak Date	Crop Hectares Affected	Hectares Sprayed	Chemicals Utilized	Chemical Stocks on Hand
Konso, S. Omo					
Borena, Oromia		2,070			
Bale, "		5,084		-	
E Hararghe, "		16,453	-	-	
W Hararghe, "		194	-	-	
Jigjiga		28,300	6,519	7,309	
Dire Dawa		1,356	1,033	1,299	
Region 13		3,000	1,555	1,821	
N Shewa, Amhara					
S Welo, "					
N Welo,					
Tigray					

Table 3. Armyworm Pheromone Trap catches at several locations in Ethiopia in 1996

Date	Konso March	Awassa April	Fedis May	Jijiga May	Jinaq-sin	Dire Dawa	Kobo
1							
2					3		
3		30			1		
4		57			9		
5		20			10		
6		60			11		
7		32			10		
8		28			15		
9	2	29			**85**		
10		38	6		**63**		
11		18	8		**315**		
12		28	17		**367**	**32**	
13		8	**38**		**500**	**456**	
14		20	**140**		**380**	**178**	
15		120	**158**	13	**350**	**446**	
16	2	120			**390**	**134**	
17	1	120			**320**	**180**	
18		120			**377**	**128**	
19	2	110		13	**281**	**234**	
20	2	110		11	**215**	**150**	
21		105		10	**118**	**110**	
22		105		8	**173**	**103**	
23	3	102		15	**209**	**33**	
24	2	10		-	**191**	**38**	
25	1	25		19	**199**	**98**	
26	2	30		23	**211**	**127**	
27	1	30		16	**185**	**170**	
28		32		13	**234**	**90**	
29		29		18	**198**	**212**	

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SECTION TWO:
Field Trip Report to North Shewa, South Welo, North Welo and Oromiya Zones - Amhara Regional State

By Admassu Haile Yesus - Field Officer, UNDP Emergencies Unit for Ethiopia, June 1996

Executive Summary

A short trip was carried out to North Shewa, South Welo, North Welo and Oromiya zones of the Amhara Region between 4 to 7 June 1996.

The purpose of the trip was to verify reports of an outbreak of armyworms in weredas of the above mentioned zones. Accordingly, the team contacted concerned authorities of the Bureau of Agriculture at the zonal and wereda level to obtain information about the extent of the damage and to inquire into the necessary measures taken by the zonal and wereda plant protection departments.

According to the head of the Kombolcha Plant Health Clinic Department a total of 3,556 ha of crop land was infested by armyworm in 8 weredas of 3 zones (North Shewa, North Welo and South Welo) in the Amhara Region between May 20 to June 4, 1996. The infestation occurred mainly on *belg*-reliant teff and to some extent on maize and sorghum that had reached their maturing and harvesting stage during our trip. As reported by the head of the Kombolcha Plant Health Clinic controlling measures taken so far have cleared 1,226 hectares of cropland by spraying, using 1,738.25 litres of chemicals (see Annex). Likewise, infestation was also reported in 3 weredas of Oromiya zone (Kemise). As the team learnt from the Bureau of Agriculture in Kemise, all 3 weredas in the zone have been affected by armyworm infestations. However, technical information on the extent of the damage, and amount of chemicals used, has not been sent to the zonal Bureau of Agriculture from the respective weredas.

In general, as mentioned by the staff of the Bureau of Agriculture at zonal and wereda level, chemical stock capacity is good except in few weredas. Additionally, the centre has allocated about 4,000 litres of Malathine and 2000 kilogrammes of Sevin for North Shewa, Oromiya, North Welo and Wag Hamra zones.(see annex).

Visited government agencies in North Welo zone

North Welo Bureau of Agriculture

As reported by the Bureau of Agriculture, 3 weredas, namely Gubalafto, Kobo and Habru, had been affected in the zone since 21 May 1996. According to information obtained, the highest infestation reported *belg*-reliant teff (2,650 hectares) was registered in Kobo wereda. Technical information that indicates the extent of the damage in the remaining weredas was not available, since the experts were in the field during our visit. However, until 3 June 1996,

a total of 506 hectares of cropland had been sprayed using 421 litres of Malathine and 25 kilogrammes of Sevin.

During discussions with the authorities lack of chemicals was not mentioned a major problem. However, concern was expressed regarding present stocks and availability in case of second generation outbreaks.

Kobo wereda Bureau of Agriculture

According to the head of the Bureau of Agriculture, 10 out of 35 kebeles in the wereda have been affected by armyworm infestation. The estimated population in the affected kebeles is reported to be 10,000 people (farmer families). The infestation occurred on *belg* crops, mainly teff, planted towards the end of December 1995, and to some extent on sorghum crops. As reported by the Bureau the infestation coverage is about 2650 hectares, of which 150 hectares is sorghum. The first infestation was reported on 20 May 1996. Control measures were taken immediately at the second larvae stage, and it was reported that 505 hectares of cropland was sprayed with 421 litres of Malathine and 25 kilogrammes of Sevin in early June. During discussions with the head of the Bureau of Agriculture it was mentioned that sprayed chemicals were washed away by continuous rains; as a result, in some weredas spraying was repeated several times.

Concern was expressed regarding availability of chemicals in case of an occurrence of second generation infestations. The Bureau were otherwise confident that available chemicals and sprayers would adequately meet current requirements.

Habru wereda Bureau of Agriculture

It was reported that out of 30 kebeles in the wereda, 20 have been affected by armyworms. The infestation occurred on 55 hectares of teff, currently at harvesting stage. As mentioned by the wereda Bureau of Agriculture, infestations were also being reported in the lowland areas of Hara (east of Habru wereda capital of Mersa). However, no accurate data was available at the time of the field visit as agricultural experts were in the field to assess the situation. Also, some concern was expressed by the Bureau of Agriculture regarding the shortage of pesticide and spraying equipment, in case the infestation expands. Requests for additional supplies of chemicals and sprayers have been sent to the North Welo zone Bureau of Agriculture and the wereda officials are awaiting a positive response.

Kombolcha Plant Health Clinic - South Welo zone

According to the Plant Health Clinic, outbreaks were reported on 22 May in two weredas of the zone (Kalu and Kutaber) on mainly sorghum and teff crops and grazing land. The extent of the damage in terms of hectarage is approximately 32 hectares of cropland and 19 hectares of grazing land. During the field the team was informed that of the above total cropland, 15 hectares has already been sprayed with Sevin and cymbuch. However, the affected grazing land had been abandoned due to lack of chemicals and pesticide and was therefore not sprayed. Farmers were also encouraged to practice traditional control measures (digging pits near their field).

There are 3 Pheromone Trap sites in the affected weredas of South Welo. However, during the visit we were told that from the existing Pheromone traps only one was operational, with the highest catch registered at 3 moths from 22 to 31 May. The problem with the other Pheromone traps was reportedly related to be the expiration of the capsule inside the trap. To alleviate the problem and to make the Pheromone trap operational again a request has been sent to the Sholla Plant Protection Department in Addis Ababa.

Visited government agencies in Kemise - Oromiya Zone

Bureau of Agriculture

There are three weredas in the zone, considered to be mainly *meher*-dependent.

According to information obtained from the zonal Bureau of Agriculture, an armyworm outbreak was reported on 31 May on the newly planted long cycle sorghum crops in a total of 28 kebeles. At the time of the field visit technical reports showing the extent of the damage were not available since all agricultural experts were in the field to facilitate and monitor the spraying process in the 3 affected weredas. A shortage of chemicals and spraying machines was reported; however, it was mentioned that 60 knapsacks, 800 kilogrammes Trychlorophone and 200 litres of Malathine has been sent to the affected weredas in order to alleviate the situation.

Visited government agencies in North Shewa

The Plant Protection Department of the Bureau of Agriculture reported that 4 weredas in North Shewa (Kewet, Ifrata and Gidim, Tarma Ber and Hageremariam weredas) were affected by armyworm outbreaks. The infestation occurred mainly on the newly planted long cycle teff and sorghum crops. Control measures were undertaken on 24 May, two days after the outbreak was reported. A total of 5 Pheromone trap sites were available but were unfortunately not operational; moth catch reports from the weredas shows no catches since the outbreak. From the total 804 hectares of infected cropland, 676 hectares were sprayed using about 888.25 litres of chemicals. The major concern at the present time is the limited logistics capacity of the zone to control a second generation outbreak.

Table 1

Data on armyworm outbreaks in eight weredas of three zones - Amhara Region
(North Shoa, North Welo, South Welo)

Location	Hectares affected	Hectares sprayed	Chemicals utilised
Kobo	2650	505	646 Ltrs.
Habru	55	55	200 Ltrs.
Kalu	38	25	-
Kutaber	73	49.5	25 Kgs.
Kewet	679.5	533	304 Ltrs.
Ifrata & Gidim	18.5	18.5	181 Ltrs.
Tarma Ber	37	33	117 Ltrs.
Hagere Mariam	7	7	265.25 Ltrs.
Total	3556	1226	1738.25

Table 2

Breakdown of chemical allocation by centre

Name of zone	Sevin	Malathine
North Shewa	400	600
North Welo	800	2000
Oromiya	400	400
Wag Hamra	400	1000
Total	2000	4000

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