AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
BATCH #14

1. SUBJECT CLASSIFICATION

A. PRIMARY
Serials

Y-AH10-0000-G100

B. SECONDARY
Agriculture--Pest of plants--Africa

2. TITLE AND SUBTITLE
Vertebrate damage control research; quelea bird problems in African agriculture: 1973 annual progress report

3. AUTHOR(S)
(101) Denver Wildlife Research Ctr.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1974	26p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Interior

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(Research summary)

9. ABSTRACT

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-RAA-710	

12. DESCRIPTORS	13. PROJECT NUMBER
Africa Pest control Quelea bird	14. CONTRACT NUMBER PASA RA(ID)1-67 Res.
	15. TYPE OF DOCUMENT

AID 590-1 (4-74)

M. Hafenrichter

VERTEBRATE DAMAGE CONTROL RESEARCH

QUELEA BIRD PROBLEMS IN AFRICAN AGRICULTURE

1973 ANNUAL REPORT PASA-RA(ID)1-67

Ag. 9

A Cooperative Program
of

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
Bureau of Technical Assistance
Office of Agriculture and Fisheries
Washington, D.C.

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Sport Fisheries and Wildlife
Division of Wildlife Research
Denver Wildlife Research Center

PARTICIPATING COUNTRIES IN AFRICA
Government of Ethiopia
Government of Kenya
United Nations Developement Program, FAO, Chad

1973 ANNUAL PROGRESS REPORT*

PRINCIPAL INVESTIGATOR:

John W. De Grazio

COOPERATING AGENCIES:

Africa -

United Nations Development Program
FAO, Chad
Government of Ethiopia
Government of Kenya

United States -

Agency for International Development
Bureau of Technical Assistance
Bureau of Sport Fisheries and Wildlife
Denver Wildlife Research Center

*RESULTS INCOMPLETE AND NOT FOR PUBLICATION, RELEASE, OR USE WITHOUT THE AUTHORITY OF THE DIRECTOR, DENVER WILDLIFE RESEARCH CENTER

ABSTRACT*

Two trips were made to the African Continent and a side trip to Turkey during the January-May period as a part of continuing AID/BSFW investigations on vertebrate pest problems. These trips were undertaken with four main objectives: (1) to continue gathering information on bird and rodent damage problems that occur in African agriculture; (2) to continue cooperative studies on quelea with personnel in Chad and Eastern Africa; (3) to develop plans for an AID/BSFW program and cooperative studies in Eastern Africa; and (4) in Turkey, to obtain information on bird and rodent damage problems and on the use of dogs for protecting domestic sheep from wolves.

Quelea quelea (Black-faced Dioch), has been reported to adversely affect the economy of 25 nations in Africa and has the distinction of being the most numerous and destructive bird in the world. Quelea damage millet, sorghum, rice, and wheat. Recognition of the problem dates back to the late 1800's, but has only recently received international attention.

Since 1950, many methods of quelea control have been devised and millions of birds have been destroyed. Aerial applications with high concentrations of very potent pesticides in roosting and nesting sites is the damage control method currently being used almost exclusively by many governments in Africa. Although heavy annual kills are made, populations have not decreased, indicating simply that surplus birds are being harvested.

Present bird control techniques need refining and other methods of crop protection should be investigated and developed. Basic research on bird behavior, movement, damage, and on selective chemicals are also requirements for the future. FAO personnel headquartered at Ft. Lamy, Chad, have begun much of this basic research. It is recommended that AID/BSFW become directly involved in the quelea problem and other important vertebrate pest problems by establishing a research project in Eastern Africa as soon as possible in 1974.

---

* This research was conducted with funds provided to the Bureau of Sport Fisheries and Wildlife by the Agency for International Development under the project "Control of Vertebrate Pests: Rats, Bats, and Noxious Birds," PASA RA(ID) 1-67.

TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	1
GENERAL INFORMATION ON QUELEA IN EASTERN AFRICA	2
VERTEBRATE PROBLEMS IN KENYA AND TANZANIA	4
Bird Damage Problems	4
Bird Damage Control	4
Rodent Damage Problems	5
DRC-1327 (4-aminopyridine) Test in Sorghum and Millet - Kenya	5
Recommendations	7
DISCUSSIONS WITH R. G. ALLAN, FAO, SOMALIA	8
Recommendations	8
DISCUSSIONS WITH SADIG BECHIR, MOA, SUDAN	9
Recommendations	9
DRC-1327 AND DRC-736 TESTS ON RIPENING WHEAT - CHAD	10
DRC-1327 (4-aminopyridine) Test	10
Recommendations	10
DRC-736 (Methyl Carbamate) Test	11
Recommendations	11
DISCUSSIONS WITH FAO PERSONNEL, ROME	12
BIRD AND MAMMAL DAMAGE PROBLEMS IN TURKEY	13
Bird Damage Problems	13
Rodent Damage Problems	14
Recommendations	14
INFORMATION ON DOGS USED TO PROTECT DOMESTIC SHEEP FROM WOLF PREDATION IN TURKEY	15
General Information on Wolves	15
Sheep Industry	16
Dogs	16
Recommendations	18

TABLE OF CONTENTS - Continued

	Page
ADDENDUMS	
DISCUSSIONS WITH GOVERNMENT OF ETHIOPIA REGARDING AID/BSFW PROGRAM IN AFRICA	19
DISCUSSIONS WITH TPRI-TANZANIA REGARDING AID/BSFW PROGRAM IN AFRICA	20
Recommendations	20

INTRODUCTION

Bird damage to agricultural crops has been a chronic problem in many parts of the world. Although considerable effort has been expended in highly developed countries to solve local or regional bird damage problems, only recently has a significant effort been made in the developing nations. In Africa, major research has been directed by the British, French, and Germans, through technical assistance programs, and more recently by FAO.

The red-billed weaver or black-faced dioch (Quelea quelea) has the distinction of being the most numerous avian species in the world, and perhaps the most destructive. Damage reportedly caused by this species dates back to 1890, but has received international attention only since about 1950. Quelea range over about 20% (2 million square miles) of the land area of Africa and adversely affect the economies of 25 nations. Crops affected include millet, sorghum, rice, and wheat. The quelea is morphologically similar to the house sparrow (Passer domesticus), but weighs less (quelea 18 g, house sparrows 25 g). The natural diet of quelea consists of small grass seeds, but when these preferred foods become scarce, damage to crops can occur. However, damage in many areas is sporadic and unpredictable.

Since 1950, many methods of killing quelea have been used and hundreds of millions of birds have been destroyed. Present control techniques include explosives and aerial applications of toxic pesticides (parathion and fenthion) to roosting and nesting sites. These control methods, however, have not appreciably reduced population levels nor effectively decreased crop damage, except in some local areas; thus, better control methods are required.

Present control techniques need refining and other methods of crop protection should be investigated and developed. Basic research on bird behavior, movement and damage is needed. More selective chemicals are also requirements for the future if control methods are to be appreciably improved. FAO personnel headquartered at Ft. Lamy, Chad, have recently begun much of this basic research. Personnel of the Denver Wildlife Research Center cooperated with FAO during field trips to Central and Western Africa, and more recently, have initiated basic research investigations in Eastern Africa (results reported in 1971-1972 Annual Progress Reports). Although quelea is of major concern, other economically important vertebrate pests such as rodents are receiving attention.

GENERAL INFORMATION ON QUELEA IN EASTERN AFRICA

(Much of this information from a field trip report
by P. Ward and M.P.L. Fogden, ODA, London)

The main bird pest in Ethiopia is Quelea quelea. It is known that it inhabits and causes damage to cultivated crops in adjacent parts of Somalia to the east/southeast, Kenya to the south, and Sudan to the west. Other species that may be of economic importance are Ruppel's Weaver (Ploceus galbula), Chestnut Weaver (Ploceus rubiginosus), Village Weaver (Ploceus cucullatus), and the Golden Sparrow (Passer luteus). The three species of Ploceus are generally found at the lower altitudes and the Golden Sparrow is found only in the North.

Ward and Fogden found very large numbers of quelea in the Rift Valley, southern Danakil, and the highlands above Dire Dawa. Government officials reported loss of grain in northern Eritrea Province bordering the Sudan (mainly millet damage), the Chercher Highlands (sorghum), the Jigjigga Plain near Somalia (millet), northwestern Ethiopia (sorghum), the Awash Valley (rice), and the remoter lowlands in southern and southwestern Ethiopia where cereal grains may be introduced in the near future. They also saw bird-scarer platforms in Wolo, Harrar, and Arusi Provinces. Urban (personal communication) was informed of a rice damage problem in the Tendaho area. East of Tendaho at Asalta, birds have been reported in wheat. At Gambela in Illubabor Province, birds damage sorghum. Ward and Fogden also collected large samples of quelea near Lake Ziway and at Melka Werer, both in the Awash Valley.

Apparently there are two distinct subspecies of Quelea quelea in Ethiopia. One, Quelea quelea aethiopica, extends westward into the Sudan and possibly western Chad and eastward to northern Somalia. The other, Quelea quelea intermedia, are primarily in Kenya, Tanzania, and Somalia but may, under certain conditions, be found in Ethiopia. Quelea movements are influenced by rainfall patterns, and both movements and rainfall are complex, but, according to Ward, there is migration of quelea between Ethiopia, Somalia, and Sudan. Research is needed to determine distribution of quelea and damage in Ethiopia, the pattern of seasonal movement, and timing and location of breeding. Many of these techniques for this type of study have been worked out by Ward and others.

Seasonal movements should be known to pursue control strategy. In a region it is helpful to know if the birds causing damage are adults as they move through on breeding migration or by their offspring that are left behind.

To gather this information it will be necessary to: (1) identify species causing damage in different parts of Ethiopia and map their distribution;

(2) work out patterns of movement in relation to season and determine timing of breeding; (3) collect and examine large samples at damage sites and determine which birds (adults and/or immatures) are doing damage.

In studies at TPRI (Tropical Pest Research Institute) Ward found that individual quelea can breed several times (up to five) in a year and move considerable distance between breeding sites, and in East Africa quelea can breed at 6 months.

Ward worked out the migratory pattern for quelea which is as follows: Quelea lay down migratory fat during short rains and leave on migration, this is November in Kenya and Tanzania. They migrate NE toward southern Somalia where they cause great damage to crops. Some individuals may commence breeding in Somalia, but most do not. After a few weeks, they return SW and stop to breed wherever conditions are sutiable. In "wet years," they breed first in South Kenya (in December). After some 6 weeks there for breeding, they depart south again and breed again in central Tanzania. After this, they move north and, following the passage of the long rains, may breed again in northern Tanzania or southern Kenya about May or June and breed again in June or July further north. Adult birds move on after breeding and leave young behind; these young birds are responsible for damage in many areas.

In Kenya, Francis Kitonyu found Quelea quelea to be the only species present at breeding roosts. In roosts other than breeding, other species of quelea are found (Q. cardinalis and Chestnut and Social Weavers), but Quelea quelea still make up 90% of the population. Breeding in Kenya follows either short rains (October-February) or long rains (March to August) or both.

VERTEBRATE PEST PROBLEMS IN KENYA AND TANZANIA

In Kenya, I had discussions with EAC (East African Community), USAID, U.S. Embassy, FAO, Ministry of Agriculture, Fisons Chemical, and Shell Chemical personnel. In Tanzania, discussions were held with USAID, TPRI, and Ministry of Agriculture personnel. All were concerned with the quelea problem in Kenya and Tanzania and welcomed new ideas and approaches that the AID/BSFW proposed program might be able to offer.

Bird Damage Problems

Serious losses to grain crops occur in both countries. Quelea is the most serious pest, but other species (primarily weavers) also cause problems. Agronomists testing new varieties of small grains on small experimental plots are extremely hard hit. Crops that are affected include sorghum, millet, wheat, and rice; apparently sorghum damage is considered most serious in Tanzania. White sorghum varieties are more susceptible to bird damage than brown varieties. Agronomists prefer white sorghums because of greater palatability, higher yields, and higher nutritive value than brown sorghums. In Kenya, wheat is the crop most seriously affected by quelea, followed by sorghum, millet, and rice. Mr. Kitonyu furnished the following information on bird damage problems in Kenya, much of which is the same for Tanzania.

Bird Damage Control

In Kenya, the Ministry of Agriculture handles all of the quelea work which has consisted of keeping track of roosting and nesting sites, movements, and control. Control consists primarily of parathion sprays, physical nest destruction, and explosives. For nearly 10 years, Mr. Francis Kitonyu, Bird Control Officer, has done much of this work.

In Tanzania, two organizations have worked on the quelea problem. The Ministry of Agriculture has primarily been concerned with roost control, namely chemical sprays and explosives. At TPRI, there is a bird control project but it is presently nonfunctional because of educational training in the United States of the project leader. From 1968 to 1971, Dr. P. Ward, Mr. G. Pope, and others under sponsorship of ODA/EAC did an excellent research study on the quelea. Their studies had to do with biogeographical and biological research and some chemical control studies. A final report has been written (July 1972) and contains much useful information on the quelea problem in East Africa that will be invaluable for other researchers.

One example of quelea control with parathion was illustrated by Mr. Kitonyu. During July-August 1972, an estimated 8 million quelea

were killed in a 6- to 8-acre roost near Nakuru, Kenya. In the Nakuru vicinity, wheat farmers suffer heavy damage to quelea. The roost was sprayed five times with a parathion (50% AI)-diesel fuel spray. Apparently quelea using this roost were migratory because of frequent applications required.

Rodent Damage Problems

Damage to small grain crops by rats (species unknown) was mentioned periodically but does not reach the magnitude of the bird problem. However, in Kenya there is a serious problem of rodents damaging maturing corn at Kitale in Transuasin Province. Zinc-phosphide-treated baits were used quite effectively last year.

DRC-132 / (4-aminopyridine) Test in Sorghum and Millet - Kenya

On February 14-16 I accompanied A. Shepherd, EAC, F. Kitonyu, Ministry of Agriculture, J. Kern and L. Peters, FCP, A. Dickey, USAID, and T. Freeman, U.S. Embassy, to the Ikuthu area (north of Tsavo National Park) and established DRC-1327 tests in standing and newly harvested sorghum and millet fields.

Four sites were baited with a mixture of 30 mg sorghum and 12 mg millet that contained about 2% DRC-1327. Treated bait was diluted with 9 parts of untreated grain and broadcast in fields at rates varying from about 1 to 5 lb. per acre. At two of the sites we were hampered by bird chasers who would not let birds into the field long enough to feed on treated bait. At one 15-acre sorghum field, up to 75% damage was evident at the time of treatment.

There were several species observed in the fields and a few of each of the following species were found dead or affected. Quelea (Quelea quelea), Emerald Spotted Wood Dove (Turtur chalcospilos), Laughing Dove (Streptopelia senegalensis), Superb Starling (Spreo superbus), Gray-headed Sparrow (Passer griseus), White-browed Sparrow Weaver (Plocepasser mahali), and the Chestnut Weaver (Ploceus rubiginosus).

Quelea were only in one of the four fields and between 500-750 birds were observed feeding both on standing millet and on the ground. Several were observed affected, showing typical DRC-1327 distress, and exhibiting erratic flight. Most birds died very quickly because of low dilution ratio, heavy bait placement, and high chemical concentration. However, typical flock reaction (hovering and chattering) to affected birds was observed.

QUELEA CONTROL UNIT, MINISTRY OF AGRICULTURE
BIRD DAMAGE PROBLEMS IN KENYA

SPECIES	CROP AFFECTED	STAGE	TIME PERIOD	AREA
Quelea quelea aethiopiea (Sudan Dioch)	Wheat	Milk	December - January and April - August	Rift Valley and Central Provinces
	Sorghum	Milk	January - March	Eastern Province
	Bullrush Millet	Any Stage	January - March	Eastern and Central Provinces
	Finger Millet	Any Stage	January - March and April - August	Eastern, Rift Valley, Nyanza and Western Provinces
	Rice	Milk	All the year round	In respective schemes in Northern, Western, Central, and Coast Provinces
Chestnut Weaver	Wheat	Any Stage	December - January and April - August	Rift Valley and Central Provinces
	Sorghum	Any Stage	January - March	Eastern Province
	Bullrush Millet	Any Stage	January - March	Eastern and Central Provinces
	Finger Millet	Any Stage	January - March and April - August	Eastern, Rift Valley, Nyanza, and Western Provinces
	Rice	Any Stage	All the year round	In respective schemes in Nyanza, Western, Central, and Coast Provinces
Other Weavers that feed on Small Grain	Wheat	Milk	December - January and April - August	Rift Valley and Central Provinces
	Sorghum	Milk	January - March	Eastern Province
	Bullrush Millet	Any Stage	January - March	Eastern and Central Provinces
	Finger Millet	Any Stage	January - March and April - August	Eastern, Rift Valley, Nyanza, and Western Provinces
	Rice	Milk	All the year round	In respective schemes in Nyanza, Western, Central, and Coast Provinces

N.B. The above given chart for crops with approximate time for damage and areas grown is more or less correct though sometimes will be affected by the rain start and the introduction of same crops to other provinces.

The Chestnut Weaver was the next most numerous bird observed in one field. About 500 were feeding in a partially harvested sorghum field, but only a few were affected. The Laughing Dove was also numerous in two of the four fields and in one, up to 150 were observed feeding on downed sorghum heads. Also many doves were affected but, as has been noted previously, there was very little reaction by the flock to affected doves.

The number of bait particles in quelea varied from 7 to 36; in doves from 18 to 83; in the Chestnut Weaver 6-21; and in the starling 8-19.

Recommendations

1. DRC-1327 tests should continue. This can be best accomplished by TDY assignment from DWRC and AID/BSFW in cooperation with the Ministry of Agriculture and EAC personnel.

DISCUSSIONS WITH R. G. ALLAN, FAO, SOMALIA

At Fort Lamy, Chad, I held discussions with Mr. Dick Allan, an ornithologist assigned to the FAO Quelea Project stationed at Mogadiscio and learned of the Quelea problem and control in Somalia.

There are two distinct quelea populations in Somalia. In the north, Quelea quelea aethiopiea are a part of the population that breed in Ethiopia and frequent this part of Somalia from May to September. There is also a distinct population in the south, Q. q. intermedia, that breeds in Somalia in June and again in September. These birds are part of the population that is prevalent in Kenya and Tanzania during other times of the year.

Quelea is more important economically in southern Somalia. Here, the crops have changed, due to quelea, from millet to sorghum and, more recently, from sorghum to corn. Because of their small size (average 18 g), quelea are not able to strip husks from ears and feed on exposed corn.

Control techniques consist of spraying toxicants, explosives, and bird scaring. Aerial and ground sprays using Queletox (Fenthion) have been used recently. One part Fenthion to two parts diesel fuel is the mixture used both for aerial and ground sprays on nesting and roosting birds. In one instance, a 3/4 hectare breeding colony near a sorghum growing area was treated with Fenthion utilizing a Unimog vehicle with sprayer attached. Only fledglings were sprayed and a very high kill was reported. The Army has used explosives in roosts with some apparent success. One group in Somalia called "sheks" are renowned as bird scarers and are reportedly quite proficient. Sheks offer their services for a fee in crop-growing areas where quelea cause damage.

It is possible that FAO will turn over quelea research to the Somalia counterpart, Mr. Mohammed Hassan Bare, in 1974. Mr. Bare is presently in training at Cornell University and AID/DWRC personnel have made arrangements for him to visit the DWRC and participate in field studies in North Dakota on blackbirds and sunflowers.

Recommendations

1. Close liaison and exchange of information should be established between the Government of Somalia, FAO, and AID/BSFW in lieu of the proposed AID/BSFW program in Eastern Africa.

DISCUSSIONS WITH SADIG BECHIR, MINISTRY OF AGRICULTURE, SUDAN

At Fort Lamy, I briefly discussed the quelea problem in the Sudan with Mr. Sadig Bechir, Plant Protection Department, Ministry of Agriculture Station, Khartoum.

The quelea probably causes more damage to small grain crops (particularly sorghum) in the Sudan than any country in Africa. In western Sudan, Q. q. aethiopiea is part of the population that frequents eastern Ethiopia. Quelea is also prevalent in other parts of the Sudan.

GTA (German Technical Assistance) did a lot of work on the development of toxic sprays (primarily parathion) and spray techniques in the 1960's According to Mr. Bechir, there is no quelea research being done by the Ministry of Agriculture, but there are six operational teams in the Sudan whose main function is roost control. The FAO team in Chad has recently initiated quelea research and cooperation in the Sudan.

Mr. Bechir mentioned a rodent (Mastomys natalensis), which weighs 30-40 g and causes problems to ground nuts and emerging corn and sorghum. In one area, it was estimated that 6 million were killed with 5% zinc phosphide sorghum bait.

Recommendations

1. Close liaison and exchange of information should be established between the Government of Sudan, FAO, and AID/BSFW in lieu of the proposed AID/BSFW program in Eastern Africa.

DRC-1327 AND DRC-736 TESTS ON RIPENING WHEAT - CHAD

On January 30-31 I accompanied FAO personnel P. Park, R. Allan, J. Jackson, and L. Bortoli and Mr. Sadig Bechir, Sudan, to Bol (North of Fort Lamy, bordering Lake Chad) and established chemical tests on ripening wheat.

DRC-1327 (4-aminopyridine) Test

Screened proso millet (9 mg) was treated with 2% DRC-1327 alcohol-acetone solution. Bait was 1 part treated and 9 parts untreated millet. Bait was placed between a shelterbelt and wheat field at the rate of about 10 lb/acre. Four species consumed treated bait and exhibited typical DRC-1327 distress symptoms; erratic flight, body tremors, and distress cries. Species affected were Crested Lark (Galerida cristata), Red Bishop (Euplectes orix), Golden Sparrow (Passer oreus), and Yellow-collared Weaver (Ploceus capitalis). It was estimated that about 100 Golden Sparrows were in the general vicinity with lesser numbers of weavers (several hundred were in the nearby wheat fields) and only a few bishops and larks. Most affected birds were weavers and sparrows, although we did pick up two larks and several bishops. Wind drifted many birds out of the area, but we did collect samples of all four species. Typical mobbing action by the flock of affected birds was not observed, in part due to the wind. There was no dramatic exit of the flock as observed in other DRC-1327 studies. To determine number of treated baits consumed, we examined proventriculus and stomach contents.

	Proventriculus	Stomach	Total
Golden Sparrow	14	18	32
	2	9	11
	2	3	5
	0	0	0
Yellow-collared Weaver	0	9	9
	0	14	14
	2	7	9
	0	0	0
			20
			25
Orange Bishop			0
			100

Recommendations

1. This initial test indicates that these species will accept treated baits and show typical DRC-1327 effects; additional tests are necessary under a variety of conditions.

DRC-736 (Methyl Carbamate) Test

The DRC-736 treatment was made on ripening wheat not yet subject to damage. A 3.2% concentration of 50% w.p. and diluted with water was sprayed under 40 psi at the rate of about 15 gal/acre. Three plots, 10 x 25 m, were sprayed. Plots were located 200 m apart in the same wheat field.

In adjoining fields, some of which were ripening, several hundred birds (primarily Ploceus sp.) were doing serious damage even in the presence of many people employed as bird scarers.

These plots were later evaluated by FAO personnel and there was only minor damage to the treated and untreated reference plots. Therefore, the data are not conclusive. The test exercise did, however, give FAO personnel experience in this type of control and FAO have initiated more testing with DRC-736 on maturing rice and sorghum in Chad and Cameroon.

Recommendations

1. FAO personnel now have experience with DRC-736 and AID/BSFW will assist FAO when requested to do so.

DISCUSSIONS WITH FAO PERSONNEL, ROME

On April 25-26 I had discussions with Dr. E. Buyckx, Dr. H. Shuyler, Mr. L. Chiarappa, and Mr. O. Sidi.

Dr. Buyckx re-expressed hopes that the AID project would continue to cooperate with the FAO Quelea Project and that the proposed AID-Ethiopia project would soon get under way. Ethiopia is not a member nation of the OCLALAV organization nor are there any FAO personnel there. Therefore, it is an important link between Sudan and Somalia and it is desirable to establish cooperation between the GOE, FAO, AID, OCLALAV, and other interested groups. A copy of the proposed AID/GOE proposal was given to Dr. Buyckx.

Dr. Buyckx also expressed his disappointment of DWRC Biologist Jerry Besser not being included as a member of the UNDP Review Mission as originally proposed. He suggested that I could make contact with the FAO Review Mission while I was in Ethiopia and Kenya.

Mr. Chiarappa was very interested in including the DWRC method of appraising bird damage to ripening corn in the FAO Crop Loss and Assessment Handbook. The original damage appraisal publication will be revised to conform with FAO format and submitted to Mr. Chiarappa.

Dr. H. Shuyler and I discussed rodent damage problems and vertebrate pest management workshops held last year in Southeast Asia by AID/BSFW biologists. He also mentioned that FAO is recruiting for an FAO position in rodent control in Pakistan. He expressed interest in working with AID projects, particularly in Southeast Asia.

While in Rome, I attempted to contact Mr. Paul Burns, USAID, but was unable to. Mr. Burns will be contacted on future trips and will be kept informed of AID/Africa activities through trip and annual reports.

BIRD AND MAMMAL DAMAGE PROBLEMS IN TURKEY

In Turkey, at Ankara, USAID/Oregon State University and Ministry of Agriculture personnel were contacted. Vertebrate pest problems encountered and observations are summarized below. In addition, I obtained information on dogs that are used to protect domestic sheep from wolves.

Bird Damage Problems

One major bird problem in many areas of Turkey is House Sparrow (Passer domesticus) and Tree Sparrow (Passer montanus) damage on ripening wheat. In middle Anitolia, sparrows reportedly cause from 40% to 60% annual losses on small wheat acreages. In the Trachia region, House Sparrows are a pest on sunflowers.

Starlings (Sturnus vulgaris) damage green and ripening olives in west Turkey. They are estimated to cause a 20% loss in olive groves and consume 8-10 olives in one feeding. Damage is caused by migratory birds and commences in September and terminates in November. In November these birds apparently migrate into southern Turkey. Nesting areas of starlings causing damage is not known, but an educated guess would probably be from Russia since migratory habits of the species have always been a northeast-southwest movement. In their southern range, starlings are implicated in damage to emerging spring wheat which is planted in November and emerges in January-February.

Doves, Columba livia (Rock Dove) and Streptopelia turtur (Turtle Dove), damage emerging sorghum. These two species also damage watermelons in the young fruit stage and losses can be as high as 90% near breeding areas.

Corvids, the Magpie (Pica pica), Hooded Crow (Corvus cornix), Raven (Corvus corex), and Jackdaw (Corvus monedula) damage ripening fruits but are considered beneficial by their habits of feeding on harmful insects and rodents. In middle Anitolia and the Black Sea region, starlings are also considered beneficial because of their insect feeding habits.

Geese (unknown species), migrants from Russia, browse emerging wheat when it is 3 to 6 inches high. This is a common problem in November in Koyna Province near Kulu and again in the spring near Tuzgolo.

Other unknown bird species cause damage in November-December to germinating spring wheat in the West Coast area. The same problem occurs in May to emerging sorghum and corn.

Very little control has been exerted against birds causing damage to agriculture in Turkey. A recent law does not allow poisoning of birds of any kind and some religions prohibit killing of certain species. In some areas, shooting and nest destruction is a means of control.

Rodent Damage Problems

The primary rodent pest is a ground squirrel (Citellus citellus gelanguis) on wheat and barley from the seedling stage to harvest. The problem area is all of Anitolia. Damage to wheat in this area is estimated at 10%. C. c. gelanguis is also a problem on pastures that sheep graze on. It was stated that 8 to 10 squirrels consumed enough grain to feed one sheep. Their burrows and mounds were very evident in small grain stubble fields. Presently, zinc-phosphide-treated wheat is being used somewhat successfully as a control agent. At one time Thallium Sulfate was used, but its use has been curtailed. Rats (Rattus, sp.) were mentioned frequently as a pest in storage. They are sometimes a problem on wheat of all stages in the Kangal area.

A hare (Lepus agrops) becomes a serious pest in winters of deep snow by destroying nursery stock in tree plantations and by barking and thus killing larger trees in the field.

Other problems mentioned were wild pig damage to corn and potatoes, and fox (Vulpes vulpus) and marten (Martes, sp.) preying on poultry.

Recommendations

1. It is recommended that AID/BSFW furnish pertinent publications on vertebrate pest control problems to Ministry of Agriculture and AID/OSU personnel for their general information.

2. A cooperative program on the problem of bird damage to emergents and olives can be established and can probably best be solved with repellent chemicals developed at DWRC. The chemical with instructions can be furnished to and evaluated by key cooperators. If a real interest is shown in working on these problems, then TDY may be in order.

3. No need for AID/BSFW to be involved in other damage problems mentioned at this time.

INFORMATION ON DOGS USED TO PROTECT DOMESTIC SHEEP FROM WOLF PREDATION IN TURKEY

While in central and eastern Turkey obtaining information on bird and rodent damage problems, I also gathered some information on the sheep industry and on dogs that are used to protect villagers, herders, and sheep from wolves.

Mr. Thomas Zinn and Dr. Homer Hepworth were my initial contacts and made arrangements for me to visit areas where sheep are raised and dogs are used. Both are US AID/OSU fellows working on improving wheat farm practices. Both had some knowledge about dogs and their use. Mr. Zinn previously provided Dr. Nels Konnerup (US AID/Washington) with some information relative to the wolf-sheep problem.

I traveled from Ankara to Kayseri with Zinn and Hepworth. I then traveled from Kayseri to Sivas and met with the Provincial Governor of Sivas Province, Vali Cecal Kaya Can and veterinarian Mustafa Kir, and discussed bird and rodent damage problems and the use of dogs. The Provincial Governor provided a driver and transportation to Kangal, about 90 miles south of Sivas, and arranged for me to meet with the City Mayor, City Clerk, Local Veterinarian and several dog owners. Kangal is the city most famous for its dogs and is where the Kangal dog derived its name.

The following is what I learned; some of this information may be in error due to translation difficulties.

General Information on Wolves

The wolf is Canis lupus; total length 115 cm, tail 45 cm, height at shoulder 85 cm, weight 35-50 kg. Range in Turkey is over most of high plateau and mountainous regions. Natural diet is rabbits, rodents, and partridge; some say even the fox (Vulpes sp.). When natural foods are short then predation on livestock increases. Wolves will not attack flocks near their dens and prey on more distant flocks. There are instances of wolves attacking humans in villages and cities and many cases of wolves scavenging in the city and following people at night, especially during a severe winter. One popular reference (Gun Digest) states in some winters, wolves take 40% of the sheep crop and also prey on other livestock. Wolves generally travel in small packs (6-12) and only one or two will attack the sheep flock.

Sheep Industry

The major sheep growing areas are: The Anatolia Plateau in the northeast, Erzwium basin in the east, and the Konya area which is south central. The Kangal-Sivas area is part of the Anatolia Plateau and is called the Long Plateau. It averages about 6000' at 40° north latitude (Denver is 39° north latitude and 5000'; therefore, climates and seasons are similar) and is surrounded by higher mountains.

In the Kangal area there are about 100,000 sheep, primarily the White Kangal Karaman breed. In Sivas Province there are about 300,000 head raised annually. One veterinarian stated there were 36,000,000 sheep in Turkey. The Kangal sheep are much taller than sheep in the U.S. and give about 2 kg of wool. They are raised for milk, meat, and wool, and much of these products are exported. There are some Merino sheep raised near Ankara and they have done some cross-breeding, but local veterinarians feel that Kangal sheep have more desirable overall characteristics such as being better feeders because of their thin lips.

Lambing in the Kangal area occurs in March and April. Most of the lambing is in sheds, but some is in pastures. The sheep diet in winter as recommended by veterinarians is dried alfalfa, straw, oats, wheat, chaff and 1% sugarbeet leftovers. More progressive sheep raisers follow these recommendations. In winter sheep are also grazed on community pastures usually in the mountains bordering the farmed plateau.

The flock is always brought into sheds for the night in winter and sometimes penned up at night during summer. Flocks vary in size from 100 to 500 animals. Each flock always has one herder, one assistant herder, and at least two adult Kangal dogs and usually a burro utilized as a pack animal. Some goats may be mixed in with the flock. All livestock is always attended by a herder. The standard size flock in the Kangal area is 500 and 1,000 in the western zone.

Dogs

The Kangal dog is a recognized breed. Another name for the dog is Karabh but a dog with this name may be mixed with another breed. The average weight of an adult male is 40 kg, adult female 35 kg. At 6 months pups weigh 10-15 kg, at 1 year 20-25 kg, and are fully grown at 2 years. Ears are clipped when they are pups for two reasons: one is that dogs with clipped ears can hear better and receive commands from the herder when in a wolf fight, and the other is that wolves cannot grab ears when fighting. For sheep work, the prime age for

dogs is 3 to 8 years; after 8 years the dog is considered a house or watchdog. The dog has a ferocious appearance, is fawn-colored with a black muzzle and ears, long-haired, deep-chested, good-sized feet, bushy tail, and square-faced. Pups are kept in the house or farmyard until 6 months of age and are weaned at 2-1/2 months. At 6 months the pup begins training with adult male and female dogs. It takes from 1 to 2 years for training. During training, pups are encouraged to fight with each other, but not to the death. Not all pups from a litter are selected for training; the practiced owner or trainer can apparently select the best pups. Usually, the best sheep-raisers have the best dogs and select their best males and females for breeding.

In trying to find out the origin of these dogs, I was told that the Turks brought the dogs with them from Asia Minor in 1200 B.C. So were the sheep. It is very rare for a dog to kill a sheep; if this happens the dog is immediately destroyed. A well-trained dog will not eat anything unless told to. The diet is called Yal and consists of sheep's milk, oats and left-over bread. The only meat diet they are given is when a sheep dies. The Turks have great affection for these dogs and some attribute them with supernatural powers. They are very gentle around the family and farmyard, but apparently are naturally aggressive against predators (man and wolf).

The dog is used to protec. sheep, herder, and villagers from wolves and to protect a man's family and property. The dogs are not used to herd but to protect sheep. The Turks feel a good dog is always faithful to his duty. When protecting sheep, dogs are outfitted with metal spike collars, spikes varying from 2 to 3 inches. If dogs are poorly trained, they may attack humans. Any knowledgeable trainer can easily handle these dogs. These dogs were used as guard dogs for the Turkish military during World War II. About 20 Kangal dogs are exported to Germany each year when they are 3 to 5 months old. Apparently the wolf-sheep problem is present in Germany.

When wolves attack sheep, the dogs will pursue, fight, and kill them. Both the male and female chase the wolf; the female usually makes the catch by bumping the wolf as he turns. When the wolf is down, the male follows and makes the kill by attacking the throat. If there is more than one wolf, then the female will fight. Dogs will not pursue wolves any great distance and leave the flock vulnerable to other wolves. The dog is a more effective fighter when encouraged on by the herder.

The Kangal dog can be purchased through the Provincial Governor. Cost varies from 500 to 2,000 lira ($33 to $133) for a highly bred dog. There is no problem getting dogs out of Turkey, but getting them through U.S. quarantine may be difficult.

Zinn told me of two people who have dogs in the U.S. They are Rodney Young, Pennsylvania State University, who raises them and Don McDonald, US/AID, Washington, who has a male and female.

Recommendations

1. In my opinion, these dogs would be practical for protecting sheep flocks in the U.S. from coyotes if flocks were small (1,000 or less) and tended by at least one herder. Using these dogs on large flocks with no herder does not seem feasible.

DISCUSSIONS WITH GOVERNMENT OF ETHIOPIA REGARDING AID/BSFW PROGRAM IN AFRICA

Meetings regarding the AID/BSFW program in Africa were held in Addis Ababa with USAID Deputy Food and Agriculture Officer R. Sweet, Dr. Haile Selassie Belay, and Ato Alemayehu Woodageneh, MOA (Ministry of Agriculture), and Dr. Dagnatchew Yirgou, IAR (Institute of Agricultural Researc Others contacted were DLCOEA (Desert Locust Control Organization of East Africa), FAO, University and Wildlife Commission personnel.

I also visited the Debre Zeit Research Station, the MOA Livestock Research Station at Debra Zeit, the IAR station at Melka Werer, and the Dire Dawa-Harrar-Jijiga-Chercher Highlands area and talked with interested and knowledgeable workers regarding quelea problems and control. Mr. Charles Temple, USAID Pilot and Plant Protection Advisor, kindly furnished his knowledge and expertise in Ethiopian agriculture and piloted the AID aricraft in these investigations. I also had discussions with Dr. Berhane Gebre Kidan of the Alemaya College of Agriculture.

After much discussion and reviewing several potential sites, it was decided that Alemaya College would be the best place to headquarter the AID/BSFW program. Dr. Dagnatchew and I reworked the draft of the proposed project and outlined GOE (Government of Ethiopia) contributions.

According to Dr. Dagnatchew, approval of the proposal will take time (2-6 months). It was decided that the proposal would be revised and submitted to AID and GOE; Dr. Dagnatchew would get an immediate and direct response from the Planning Commission of their interest and support, and negotiate with Alemaya College. The proposal for Ethiopia is detailed in the May 1973 Trip Report.

At the present time, it appears that the proposed AID/BSFW program will be established in Tanzania. Mr. Sweet, Dr. Dagnatchew, and Dr. Belay were made aware of this possibility.

DISCUSSIONS WITH TPRI-TANZANIA REGARDING AID/BSFW PROGRAM IN AFRICA

At Arusha, I met with Mr. George Ramsey, USAID, and Dr. Materu, Director of TPRI (Tropical Pest Research Institute), and discussed the feasibility of an AID/BSFW quelea program in Tanzania. Both Mr. Ramsey and Dr. Materu were very enthusiastic about the proposal and suggested TPRI as project hadquarters.

We briefly reviewed a draft copy of the proposal, and Dr. Materu stated he would initially present the idea to the Secretarial of Ministries. If an interest is shown, he will then submit the proposal to the EAC (East African Community) Social Research Council. This council is composed of three members at large and three representatives each from Tanzania, Kenya, and Uganda. Both Mr. Ramsey and Dr. Materu were made aware of our negotiations with the Government of Ethiopia.

We also viewed TPRI facilities, which is on about 25 acres and consists of about 20 buildings. Activities at TPRI includes research on insecticides for tsetse, mosquitos, and other insects that damage tropical agricultural crops; herbicides, fungicides, and molluscicides. These activities are backed up by a chemistry, physics, and engineering staff and laboratories. TPRI also has several field stations where research is underway.

Also at TPRI, there is a Tropical Bird-Pest Research Project, formerly under direction of Dr. Ward, ODA (Overseas Development Administration). The project is awaiting Mr. Gilbert Maeda's return from a Masters program in the United States to resume activities. The bird project building at TPRI is well equipped, consisting of three small laboratories, map room, office, and storage. A small aviary is adjacent to the project building. Field and laboratory equipment are available. Necessary back-up staff would be furnished as required.

Interest by AID and TPRI personnel is enthusiastic, facilities are very adequate, and potential experimental sites are available at TPRI field stations. The bird damage season, if Kenya is considered as part of the work area, can last for up to 4 months. Experimental field sites close to TPRI are at a minimum; therefore, extensive travel would be necessary.

Recommendations

1. It is recommended that TPRI be strongly considered as the site for the AID/BSFW project within the next 2 years. In the interim,

it is recommended close liaison be maintained with AID, TPRI, Ministry of Agriculture, and EAC. It is also recommended that before the AID/BSFW program is established, TDY from DWRC occur during damage seasons in Tanzania and Kenya.