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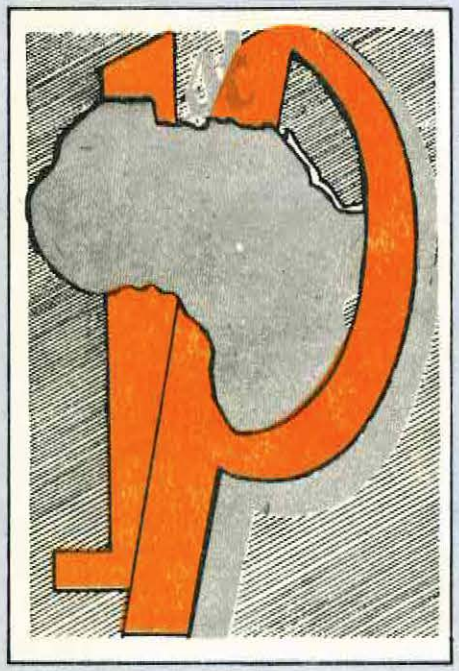
P.O. BOX 30772, NAIROBI, KENYA

PROCEEDINGS



ANNUAL CONFERENCE OF AFRICAN REGIONAL PEST MANAGEMENT RESEARCH AND DEVELOPMENT NETWORK (PESTNET) FOR INTEGRATED CONTROL OF CROP AND LIVESTOCK PESTS, NAIROBI, KENYA

27–30 APRIL 1987

ICIPE SCIENCE PRESS

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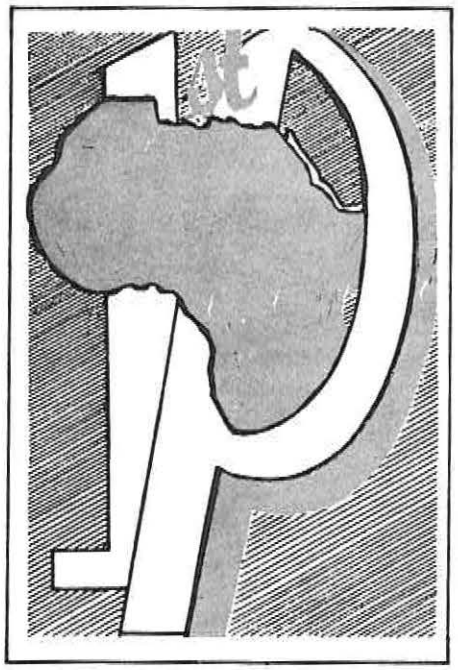

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1 INTRODUCTION

Arising from the recommendations made by the national delegates to the meeting of the Working Group on the Implementation of the African Regional Pest Management Research and Development Network (PESTNET) for Integrated Control of Crop and Livestock Pests, held in Nairobi 22–26 June 1986, the first Annual PESTNET Conference was organised from 27–30 April 1987. The meeting had several purposes. Firstly, it was to review the progress made by the Network, and the proposed work-plans for the following year. Secondly, it was to assist the PESTNET Secretariat to focus on the operations of the Network. Thirdly, and most importantly, it was to ensure effective national involvement and collective responsibility in steering the Network's performance.

PESTNET involves several tiers in its planning, organisation, implementation and the monitoring of its responsiveness to member country concerns in order to be as effective as possible. These tiers include an Interim Steering Committee which will operate until national delegates elect the Steering Committee at their 1988 Annual PESTNET Conference. This Committee advises the Network's Coordinating Unit on behalf of the member countries and reports to the Annual PESTNET Conference. The Steering Committee also acts as custodian of the interests of member countries and institutions.

At this first annual meeting of national delegates, a detailed progress report and the initial programme of activities were presented and thoroughly discussed. The progress made in the sector of information exchange was noted with satisfaction by the participants, and the proposed collaborative arrangements for sharing information and scientific personnel among national programmes were very well received.

The International Centre of Insect Physiology and Ecology (ICIPE) and the PESTNET Secretariat were commended for their efforts in ensuring effective functioning of the Network. They were urged to develop a highly detailed long-term projected programme so that national governments and development institutions are provided with a realistic calendar of future PESTNET activities.

2 PROGRESS REPORT

"Start the work and build around it" was the philosophy adopted by the PESTNET Working Group in 1986.

2.1 Institutional Organization and Linkages

The PESTNET Secretariat became functional on 1 October 1986. It is the focal point of the Network's activities and is charged with the coordination of PESTNET within ICIPE's Outreach and Training Unit. A Scientific Coordinator also assumed office on 1 October 1986. The Secretariat has a support staff of one, a Secretary, and support facilities including office space and facilities for typing and word processing.

Formal commitment to participate in PESTNET was received from the Government of the Republic of Zambia, in addition to the long-standing agreement with the Somalia Democratic Republic which will be harmonised with PESTNET. Other member countries have continued to provide very positive support for the Network's objectives and activities.

In all countries, except Tanzania, where PESTNET collaborative activities have been initiated, the priority is on crops, basically to avoid overstretching of resources and to develop an effective framework of implementation by perfecting the approaches currently adopted.

Sudan appointed a national PESTNET Coordinator and informed the Secretariat of this action. In all other member countries, where national coordinators have not yet been appointed, there are link persons in the relevant fields of ticks, tsetse and crops who are in charge of PESTNET activities. They will coordinate in-country R & D programmes for the Network.

Assessment of national capacity profiles started late last year with the study of national institutional structures, to be followed by assessment of resource profiles. A database for recording national pest management capacity is being developed in readiness for information collection, and will include profiles of pest management resource personnel.

The exchange of information as a linkage mechanism was established between the Secretariat and all member countries in the form of the newsletter *PESTNET TODAY* which was inaugurated together with the Secretariat on 1 October 1986. Subsequent issues of *PESTNET TODAY* came out on 1 January and 1 April 1987. The newsletter is aimed at furthering the exchange of information and experience among network scientists and institutions.

A report on the pest situation in member countries was released through the proceedings of the meeting of the International Working Group on the Implementation of PESTNET held in June 1986. The progress report given during this First Annual PESTNET Conference, together with National Reports giving the pest management situation and progress in implementing PESTNET in individual countries, will appear as a special issue of *PESTNET TODAY* to be published by 1 July 1987.

In addition to this quarterly newsletter, a number of documents have already been published by the Secretariat. These include:

- PESTNET profile
- Proceedings of the International Working Group on the Implementation of the African Regional Pest Management Research and Development Network (PESTNET) for Integrated Control of Crop and Livestock Pests, held in Nairobi, Kenya, 22–26 June 1986
- Proceedings of the Planning Workshop on the African Regional Pest Management Research and Development Network (PESTNET) for Integrated Control of Crop and Livestock Pests (6–8 October 1985).

An extensive network mailing list has been compiled and is continually being updated.

2.2 Training

The first cooperative national PESTNET training workshop, jointly sponsored by ICIPE, the Food and Agriculture Organization (FAO) and the Zambian Government

on Methodologies for Assessment of Stalkborer Infestation and Damage Levels on Maize is scheduled to take place in Zambia, from 9–11 June 1987.

Under the Network Research Associate Scheme, the first candidate has already been selected from Zambia. Her tenure will commence in June this year for three months at the ICIPE Mbita Point Field Station with the Crop Pests Research Programme. An M.Sc. candidate from Somalia was registered with Sokoine University of Agriculture funded by the Canadian International Development Research Centre (IDRC). A request has already been received from Zambia for long-term training leading to a Ph.D. for one of her scientists. For short-term training, invitations were sent to member countries, and announcements were included in the January and April issues of *PESTNET TODAY* for the next International Group Training Course due to be conducted in Nairobi by ICIPE from 9–29 August 1987. An in-service training course was organised from April to June 1987 for two technical officers from the Crops Research Division Uganda. The two officers are currently attached to ICIPE's Crop Pests Research Programme at Mbita Point Field Station, updating their skills in pest management methodology.

2.3 Cooperation

Close contact was maintained by the Secretariat with all member countries. Cooperative agreements have already been signed with Somalia for technology development and training for manpower development in the crop sector of pest management; and with Zambia to undertake joint validity trials and technology development, and to collaborate in training for manpower development.

Research and development aspects requiring in-country investigations, and those essential for developing new technological packages, have been identified for both countries. A grant proposal has been developed jointly by Somalia and the ICIPE for submission to donor agencies. In the case of Zambia, a project proposal will be submitted to donors for consideration for bilateral funding. Plans are also quite advanced for a project identification mission to Rwanda.

The ICIPE has also concluded a collaborative agreement with the Tanzania Livestock Research Organisation (TALIRO) in research, training and general institutional capacity building, which will be harmonised within PESTNET.

Draft agreements proposed in respect of Kenya and Uganda will formalise current activities being undertaken within the PESTNET framework in the two countries.

Contact has been established with Rwanda. A visit to Rwanda by the PESTNET Coordinator has been arranged, and discussions are to open soon to explore definite areas of collaboration under PESTNET.

2.4 Funding Arrangements

Through the efforts of its Director, Professor Thomas R. Odhiambo, ICIPE was able to provide funds to finance all the pre-implementation activities in 1986 and has provided to date: seed money for exploratory missions, publication of the PESTNET newsletter, expenses for the first Annual PESTNET Conference and expenses for lead speakers/consultants at the forthcoming workshop on stalkborer damage to be held in Zambia next month. The FAO has also generously offered to provide, through its project funding in Zambia, partial support for this workshop.

The IDRC has kindly provided the funds for the training of the Somali national, mentioned above, for an M.Sc. degree at Sokoine University of Agriculture, including his support at ICIPE while conducting his thesis research.

Several donors have already been approached to provide funds to support the Secretariat, information and exchange bulletins and some of the initial collaborative activities.

The ICIPE will assist by developing joint project proposals which national programmes will submit to donors for bilateral funding.

2.5 Conclusion

PESTNET has started its activities strongly, with clearly defined objectives, and high potential for success. We look for total commitment and support from member countries, in order to make PESTNET a practical demonstration of a collaborative undertaking.

2.6 Discussion of the Report

The participants noted with satisfaction the progress made by PESTNET in such a short time. They were particularly pleased to see that Research and Development aspects requiring in-country investigations were emphasised in the Network's cooperation and linkages. They felt this would take care of the wide variety of problems to be found in different member countries, whilst at the same time it would allow for acquisition of information under different ecological circumstances which would be shared by member countries and other institutions in Africa.

The newsletter, *PESTNET TODAY,* was highly commended as an appropriate channel for the exchange of information among scientists and institutions. It was recommended that more copies should be produced and widely distributed.

To a suggestion that national workshops should be open to attendance by participants from other countries, it was indicated that national workshops are organised for in-country participants, using national resources and on subjects of local concern. Usually, national methodology workshops would precede in-country collaborative research activities. Participation by outsiders would not be relevant and might curtail the number of national participants. Regional workshops will assemble participants from different national programmes and would usually be organised for standardisation of techniques and methods.

One useful contribution was received from the representative of a donor agency who sought information on how ICIPE sees its role in PESTNET collaborative activities, and received an explanation from the Secretariat. He said that there are 50 agricultural networks in Africa and one donor network known as SPAAR (Special Programme on African Agricultural Research) which

meets twice yearly to consider the financial needs of all the African networks. PESTNET would therefore face stiff competition. Its planning must be forward-looking and precise in terms of programme needs. He advised national programmes to discuss PESTNET with their governments so that national planning organs and resource allocators are appraised of pest management problems and the potential usefulness of the Network.

The report was endorsed.

3 COOPERATION AND LINKAGES: PROGRAMME OF ACTIVITIES (1987–88)

3.1 Research and Development Programme

This was drawn up realising that the activities, character and level of participation by member countries in the R&D component of the PESTNET will vary depending on national resources and donor support. The programme takes into account activities already in progress in some of the member countries which must continue. These will be harmonised with PESTNET. It is planned to undertake the following activities:

3.1.1 Field Tests and Trials.

(i) With resistant maize and sorghum varieties, identified by the Network in different PESTNET ecological zones to test their efficacy. In this respect, validation, field tests and trials that are currently undertaken jointly with the national research programme in Kenya will be extended, on invitation, to other member countries.

(ii) Evaluation of traditional maize and sorghum germplasm and cultivars for resistance to target pests, using the standardised methods developed by national programmes and the ICIPE and various International Agricultural Research Centres.

(iii) Evaluation of the effects of intercropping on pest attack and subsequent crop loss in the different participating countries, and testing the efficacy of combinations which suppress pest attack.

These activities will be undertaken at national research stations jointly with national scientists. The aim of such joint investigations is to develop pest management packages related to the needs of individual member countries. Collaborative efforts will be concentrated initially on a few countries but will eventually spread to all PESTNET members.

Although the initial emphasis in PESTNET will be on crop pests, ICIPE's Tsetse Research Programme plans to evaluate the effectiveness of targets in small, isolated pockets of tsetse infestation using odour-baited traps. This will be done in collaboration with selected national programmes, and the arrangements will subsequently be harmonised by PESTNET.

3.1.2 Collaboration with Somalia and Zambia. The biology and ecology of crop borers, especially those of sorghum and maize, in both rain-fed and irrigated areas, will be investigated jointly. The objective is to develop a technological package for controlling maize and sorghum stemborers in Somalia. This project will become a PESTNET activity.

Collaborative investigations will be undertaken with Zambia on levels of stemborer infestation and damage, to assess the stemborer problem under smallholder farming conditions.

3.1.3 R&D Collaboration with Rwanda. A mission to Rwanda will be undertaken in preparation for a Project Identification Meeting (PIM). A proposal for submission to bilateral donors for possible funding will be prepared.

3.2 Training

3.2.1 Methodology Workshops. Regional Methodology Workshops are planned from among those topics suggested by the PESTNET Working Group in 1986. The idea is to share research experiences in methodology and techniques in pest management. Participants will come together, in different member countries, from national research programmes and extension services. It is intended that national training workshops will then be held in individual countries, in order to strengthen national capabilities.

Planned regional methodology workshops include:

(i) *Crops*
- Loss assessment
- Evaluation of germplasm for resistance to target pests.

(ii) *Ticks*
- Testing for resistance to acaricides
- Incorporation of new acaricides in integrated tick control.

(iii) *Tsetse*
Population assessment techniques that are essential in the study of tsetse population dynamics.

(iv) *Joint national training workshops*
These are planned on methodologies and techniques for assessment of stalkborer infestations and damage levels on maize. The first will be held in Zambia in June 1987, as mentioned already.

3.2.2 Research and In-service Training. Training activities form an important component. The following are planned and will be undertaken within the existing ICIPE training programme:

- Young scientists from member countries will be invited through announcements in the PESTNET newsletter to participate in the annual International Group Training Courses on Pest Management.
- Research training to selected nationals of member countries through the African Regional Postgraduate Programme in Insect Science (ARPPIS).
- Research management training to nationals within the network through national workshops organised by FAMESA (Financial and Administrative Management of Research Projects in Eastern and Southern Africa).

3.3 Fund Raising Strategy

The underlying philosophy of PESTNET is that of an interactive partnership aimed at developing and strengthening the pest management capacity of national research and extension programmes. There will be a major effort to locate sufficient funding to enable the proposed programme of activities to be sustained, with the emphasis on identifying fundable projects. The ICIPE will assist national programmes to develop grant proposals which they could then submit to bilateral donor agencies. The ICIPE itself will also seek funds for PESTNET activities from relevant assistance organisations.

3.4 Discussion

The need for close liaison in the development of PESTNET collaborative activities was stressed. It was agreed that the Secretariat would be responsible for designing R & D and training activities, but would do this in consultation with the various national programmes, relevant ICIPE programmes and appropriate development agencies.

The collaboration of the Steering Committee was accepted as an appropriate mechanism for assisting the Secretariat in the preparation of the proposed programme of activities.

One member asked whether a regional workshop would be combined with the Annual Research Conference. It was pointed out that methodology workshops include demonstrations, discuss approaches to research investigation, and deal with applied questions. PESTNET conferences, on the other hand, are held to review progress and examine proposed plans of action. In doing so, they may discuss pest situations, but not control techniques as would be the case with methodology workshops.

The Secretariat was advised to review the timing and frequency of methodology workshops in order to ensure that they are well spread and effectively implemented.

The national delegates and the other participants endorsed the initial programme of activities, and recommended that the programme be developed into detailed project proposals which could be submitted to donors for possible funding.

4 INFORMATION FLOW

4.1 Exchange of Information on PESTNET Activities

In order to promote this exchange the participants recommended:

(a) Establishment of a quarterly newsletter — *PESTNET TODAY*
(b) Holding annual PESTNET conferences, to coincide with the ICIPE Annual Research Conferences, in order to review progress made so far and to draw up work plans for the following two years on a rolling basis, and also to highlight achievements in transfer of technology.

The newsletter was initiated in October 1986 and three issues have now been published on schedule.

This first Annual PESTNET Conference has been organised to coincide with the 17th ICIPE Annual Research Conference, to which delegates to the PESTNET meeting have also been invited.

The PESTNET Coordinator requested government delegates:

(a) to note the progress made in the exchange of information
(b) to suggest to the Secretariat effective mechanisms for obtaining research reports and articles from scientists in national programmes.

During the discussions on this presentation the delegates expressed satisfaction with the progress made in the exchange of information on PESTNET activities and recommended that efforts should be made to prepare a series of simple loose-bound manuals providing information on a wide range of topics concerned with pest management.

The Secretariat also informed the participants that there are plans to develop an information, documentation and retrieval system to serve PESTNET. A progress report will be available at the 1988 Annual PESTNET Conference.

4.2 PESTNET Release Protocol

The 1986 PESTNET Working Group recognised the importance of sharing knowledge and the exchange of information and urged the Secretariat to prepare a simple data release protocol which would be agreeable to member governments. It was suggested that such a protocol should embrace the publication, and/or holding by PESTNET, of data for the mutual benefit of the network members. Technology transfer between member countries should be through the appropriate channels via country PESTNET representatives.

The Secretariat was drafting a data release protocol which will be submitted for appraisal to member governments, whose reactions will be presented to delegates at the next Annual PESTNET Conference. Delegates were requested to advise the Secretariat on the most appropriate way to approach their respective governments on this very important issue.

The participants endorsed this action and again stressed the critical importance of sharing information. They felt that this element of PESTNET was very useful, and national programmes should recognise the potential benefits to themselves.

5 COUNTRY STATUS REPORTS

CROP PESTS IN BURUNDI

P. Ndayiragije

Introduction

In Burundi, cassava covers 9% of the total agricultural area, amounting to 80,000 ha, and represents 15% of the annual production of food crops. The yield is still low (6 tonnes/ha) due to poor soil fertility, unsuitable cultural practices and diseases and pests, namely African mosaic virus and cassava green mite (CGM), *Mononychellus tanajoa* (Bondar). The latter is actually the most important pest of cassava in Burundi.

The CGM was detected in Burundi in 1974. Since then the mite has spread to all cassava-growing regions in the country. Studies on the incidence of CGM according to planting time and variety have shown that late plantings suffer mite attack which causes yield losses, depending in severity on the variety planted. The pest causes the most severe damage to the top young leaves, resulting in a drastic reduction in leaf area. Heavy yield losses were recorded in these trials: 31% in weight for fresh tubers, 70% reduction in leaf area and 23% reduction in height for cuttings.

This pest must be controlled by using resistant varieties, suitable cultural practices and the development of biological control. This paper reports the response to CGM of cuttings in two fields, one protected against mites and the other not.

Materials and Methods

The experiment was carried out at the end of January 1986 using three varieties. "Nakarasi" is bitter and has a short cycle; "Criolinha" is also bitter and has a long cycle; "Mpambayabashengera" is sweet with a long cycle.

The experimental design was a split-plot with four replications in randomised blocks. One sub-plot for each replication was planted with cuttings from a field protected against CGM by spraying with dimethoate E.C.40% fortnightly. The other sub-plot was planted with cuttings from non-protected fields. The cuttings were then 12 months old.

Each sub-plot consisted of 28 plants in a four-row configuration; plant spacing was 1m x 1m. The plots were hand-weeded. Sampling for leaf damage began in mid-May 1986 when symptoms of CGM infestation were prevalent.

The degree of mite damage was scored fortnightly on the first fully expanded leaf. This can be distinguished from the other young leaves by the darker colour, and from the older leaves because the petiole joins the stem at an angle of less than 90°. Ratings were made on four plants per sub-plot for each census and based on the following scale:

1. No mite damage
2. Chlorotic spots present, but less than 5% of the total leaf area affected
3. Chlorosis more severe, 5–50% of the leaf area affected; may be some reduction in leaf size
4. Chlorosis very severe, more than 50% of the leaf affected; the leaf appears yellowish because of the loss of chlorophyll; leaf size reduced
5. Leaf is dead or has dropped due to mite feeding activity.

Twelve months after planting, 20 plants were harvested per sub-plot for assessing root yield and plant height.

Table 1. Mean yields of three varieties of cassava grown with, and without, protection against cassava green mite attack

Variety	Root weight (kg/plant)		yield loss %
	Protected	Unprotected	(unprotected)
Nakarasi	1.76	1.06	40
Criolinha	2.10	2.20	0
Mpambaya-bashengera	1.40	1.06	24

Results and Discussion

The damage started in mid-May and reached a high level in the dry season (July–August). This attack caused severe defoliation of the top young leaves and consequently the mite population decreased. Rain in mid-September allowed the development of new leaves, and then the mite population increased, reaching its maximum at the end of September. The heavy rains of November caused a decrease in the number of mites, which dropped to a low level in December–January.

The yield losses due to CGM are summarised in Tables 1 and 2.

Table 2. Mean heights at harvest of three varieties of cassava grown with, and without, protection against cassava green mite

Variety	Plant height (m)		yield loss %
	Protected	Unprotected	(unprotected)
Nakarasi	1.74	1.53	12
Criolinha	1.90	2.12	0
Mpambaya-bashengera	2.00	2.02	0

Conclusions and Perspectives

The effect of CGM on the cuttings was to depress the fresh weight yield of roots by 40% and 24% for Nakarasi and Mpambayabashengera respectively, and the height of Nakarasi plants by 12%. Analysis of variance showed that there is a significant difference between varieties ($P < 0.05$) for both root yield and height, but no significant difference between protected and unprotected plots.

Criolinha appears to be the variety most resistant to the mites while Nakarasi is the most susceptible according to the leaf symptoms.

The use of resistant varieties, suitable cultural practices and biocontrol is necessary.

CROP PEST CONTROL IN KENYA

F.M. Olubayo

The pest situation has not changed from that reported in the proceedings of the PESTNET Working Group,

although there have been some recent developments.

A new scale insect *Icerya pattersoni* was reported on coffee. Preliminary trials with pesticides have been undertaken at the Coffee Research Station, Ruiru. The search for biocontrol agents continues in collaboration with the Commonwealth Institute of Biological Control (CIBC), Muguga. Efforts are being made towards developing an integrated pest management (IPM) system for coffee pests.

Cotton pests continue to decrease yields, although the crop acreage is also on the decrease. Continuous screening of pesticides is still undertaken for the purposes of updating control recommendations. A proposal for integrated pest management was made by FAO and the Ministry of Agriculture. We are soliciting funds to implement the programme.

We are regularly monitoring the spread of the (Larger) Greater Grain Borer *(Prostephanus truncatus)* which entered the extreme south of the country in 1983 from Tanzania. Preliminary trials for the control of the borer with insecticides have been undertaken. We are currently recommending the use of permethrin for grain admixture and store disinfestation.

The reorganization is in progress of agricultural research into a National Agricultural Programme (NAP) under the Kenya Agricultural Research Institute (KARI). The institutional framework for different disciplines of agricultural research will be elaborated in the near future. The entomological component will, in broad outline, include aspects of:

Biological control
Pest surveys
Pest biology and taxonomy
Pesticide screening
Pesticide residue monitoring and analysis.

It is expected that there will be close collaboration with other institutions undertaking similar research.

LIVESTOCK PEST CONTROL IN KENYA

R.M. Injairu

Introduction

Kenya has an estimated livestock population of 10 million cattle, 6 million sheep, 5 million goats and 600,000 camels. Productivity of these livestock has been constrained by two major livestock pests, namely ticks and tsetse flies.

Ticks

Ticks and the tick-borne diseases they transmit (theileriosis, heartwater, anaplasmosis and babesiosis) constitute one of the main impediments to livestock development in Kenya through reduced growth rates and high mortality in susceptible cattle. To cope with this challenge, the Department of Veterinary Services has adopted the following measures:

(a) *Tick control.* The objective of this measure is the protection of the susceptible cattle population from ticks and their effects, using acaricides. This method of tick control entails construction of a network of plunge dips in the country and provision of finance for purchase of acaricides.

Due to the cost involved, tick control is presently limited to the high potential areas of the country where the cattle kept are highly susceptible. In the range areas, where the local breeds of cattle predominate, minimal tick control is practised, natural tick resistance being the only method of control. The general management of ticks in the country is governed by the Cattle Cleansing Act under which acaricides are registered, and areas of compulsory dipping of cattle gazetted, by the Pest Control Products Board.

(b) *Tick research.* Use of acaricides for tick control is complicated by the development of tick resistance to these chemicals. There is therefore a need for continuous development and screening of potential acaricides to ensure availability of effective chemicals all the time. In this connection, the activities of the Tick Research Laboratory at Kabete involve:

1. Tick resistance testing and surveys
2. Screening of chemicals with acaricide potential
3. Tick ecology studies in collaboration with ICIPE.

In support of these efforts, FAO/Danish Agency for International Development (DANIDA) have funded the construction of a new Acaricide Laboratory and the provision of equipment for tick research at the Veterinary Research Laboratory at Kabete.

Tsetse flies (Glossina *spp.)*

As vectors of trypanosomiasis caused by *Trypanosoma vivax, T. congolense* and *T. brucei,* tsetse flies present a formidable challenge to Kenya because of their wide distribution, lack of vaccines for the control of trypanosomiasis, and the cost of drugs required for chemoprophylaxis. Presently, tsetse fly is controlled by bush clearing and selective application of insecticide in some parts of the country, especially where human trypanosomiasis is prevalent. Control of animal trypanosomiasis is dependent on treatment with trypanocidal and chemoprophylactic drugs.

The complex problem of tsetse fly and trypanosomiasis control is reflected in the number of institutes involved in research on trypanosomiasis. Under the Nairobi Cluster of Institutes, ecological studies of the vector are undertaken by ICIPE and the Kenya Trypanosomiasis Research Institute (KETRI) while research on the immunological control of the parasite is the mandate of the International Laboratory for Research on Animal Diseases (ILRAD). The Wildlife Diseases Project at the Veterinary Research Laboratory at Kabete is engaged in studies concerning the trypanotolerant mechanisms obtained in game animals.

MAJOR LIVESTOCK PESTS IN MALAWI

R.C.J. Mkandawire

Malawi is a land-locked country which is located along a sector of the Rift Valley between latitudes 10° and 17°S. The country is bordered by Zambia to the west, Mozam-

bique to the east and south, and by Tanzania to the north. Administratively it is divided into Northern, Central and Southern Regions. The population of Malawi is currently estimated at about 6.5 million people, occupying approximately 94,000 km^2 of land.

Malawi's economy is based on agriculture which provides about 85% of the total export earnings.

Topographical Zones

The country is divided into three topographical zones:

1. *The Rift Valley.* This extends from the lower Shire Valley where the altitude is as low as 35m above sea level, to Lake Malawi and along the lowlands of the western lakeshore to an altitude of 760m above sea level. Annual rainfall varies from 635mm in the Shire Valley to over 2,500mm in some lakeshore areas that face the rain-bearing winds.
2. *The Middle Plateau.* This includes the area lying between 760–1370m above sea level separated from the Rift Valley Floor by dissected escarpments.
3. *Hill Zones.* These comprise all areas above 1370m.

Climate

Malawi experiences two main seasons: a rainy season (November–March) and a dry season which is further subdivided into a cool period (May–July) with some precipitation over the highlands, and a hot, dry period (August–October).

Livestock

The estimated livestock population is about 1 million cattle, 900,000 goats, 200,000 pigs, 150,000 sheep and over 10 million poultry. Cattle are considered the most important component of the livestock population, and most of them are kept under the traditional management system. The dominant cattle breed is the small, humped, indigenous East African Zebu (Malawi Zebu). Exotic breeds like Friesian are, to a smaller extent, kept at government livestock centres and on some private estates. Malawi Zebu x Friesian crosses are common on smallholder dairy farms.

Tick Species That Affect Cattle

Over 30 tick species have been identified from various animal species. Those that are found on cattle, with their order of importance and distribution, are shown in Table 3. Little work has been done to correlate species distribution with vegetation, physiography or climate. However, it has been observed that the period of highest tick challenge is the rainy season (November to March).

Table 3. Major species of ticks affecting cattle in Malawi

Species	Order of importance	Distribution
Rhipicephalus appendiculatus	1	Throughout the country but mostly in Central and Northern Regions
Boophilus microplus	2	Throughout the country
B. decoloratus	3	Throughout the country
Amblyomma variegatum	4	Throughout the country
Hyalomma marginatum rufipes	5	Lowlands and along the lakeshore
H. truncatum	5	Lowlands and along the lakeshore
Rhipicephalus evertsi	6	Widespread
R. pravus group *R. simus* group *R. sanguineus* group *R. tricuspis* *R. compositus*		These species have been reported to occur, but exact information is not available

Adapted from FAO (1982). Mission Report. Internationally Coordinated Five-year FAO/DANIDA Programme for Tick and Tick-borne Disease Control in East and Central Africa. AG: GCP/RAF/169 DEN.

Tick-borne Diseases

East Coast fever (ECF, *Theileria parva* infection) is the most important of the tick-borne diseases that occur in Malawi (Table 4). It causes the greatest number of cattle deaths. The vector, *Rhipicephalus appendiculatus,* is also present in the Southern Region but *T. parva* is absent. Exotic cattle and Zebu crosses require intensive tick control to prevent losses. There is little cattle-buffalo contact and *Theileria lawrencei* has not been recorded.

Table 4. Major tick-borne diseases of cattle in Malawi, in order of importance

Disease	Causative organism	Animals at risk	Distribution
Theileriosis	*Theileria parva*	60%	Central and Northern Region (2/3 of country)
	T. velifera	?	Not important
	T. mutans	100%	Throughout the country, pathogenic
Babesiosis	*Babesia bigemina*	100%	Throughout the country
	B. bovis	100%	Much less common, but more pathogenic
Anaplasmosis	*Anaplasma marginale*	100%	Throughout the country
	A. centrale	?	Rare. Difficult to apportion importance between species
Cowdriosis	*Cowdria ruminantium*	?	Occurs, but rarely diagnosed
Sweating sickness	*H. truncatum* (toxin)	?	Occurs, but not common

Adapted from FAO (1982), see Table 3.

Control of Ticks and Tick-borne Diseases

Control of ECF and other tick-borne diseases is based on intensive tick control by weekly dipping. The Government operates over 350 communal dipping tanks (including a few sprays) which are distributed throughout the country. Various types of acaricide are in use depending upon availability, price and simplicity in monitoring acaricide strength in dip fluids.

Despite a good coverage of the country with dipping tanks, the problem of ticks and tick-borne diseases is still high. This is partly due to inconsistency in dipping attendance amongst traditional cattle holdings, inadequate supply of acaricides (which have become extremely expensive) and dip tank mismanagement.

Acaricide resistance has been shown to exist in some tick species, but very little work has been done in this field and more research is required in order to ascertain the extent of the problem.

Research

The Government recognises the seriousness of the economic losses that occur in the livestock industry due to ticks and tick-borne diseases and hopes that an effective ECF immunization technique plus strategic dipping may be the answer to the problem. This is being investigated. In addition, more in-depth studies on ticks need to be carried out.

Tsetse Fly Situation

Malawi is currently experiencing a marked resurgence of tsetse fly and this has resulted in a high incidence of bovine trypanosomiasis. It is estimated that about 250,000 head of cattle are at risk to the disease.

Most of the fly is found in the game and forestry reserves, and in some areas the fly belts extend into the neighbouring countries of Mozambique and Zambia. *Glossina morsitans* is the commonest species and to a lesser degree *G. brevipalpis* and *G. pallidipes.*

Under the EEC-funded Regional Tsetse and Trypanosomiasis Control Programme of Malawi, Mozambique, Zambia and Zimbabwe, tsetse fly and trypanosomiasis surveys are currently being conducted. The results of these surveys will provide a basis for formulating a comprehensive tsetse and trypanosomiasis control strategy.

Constraints

1. Shortage of appropriate manpower
2. Financial limitations.

STATUS OF INSECT PESTS OF AGRICULTURAL CROPS IN SOMALIA

A. H. Hassan and F. Nur

Pests of Major Crops

Maize. Stemborers — up to 50% loss in absence of control measures.

Heliothis armigera — second most important pest, occasionally serious.

Aphids — occasional pests.

Sesame. Sesame webworm is a very serious pest every season; can cause losses of up to 50%.

Cowpeas and mungbeans. Maruca sp. (pod borers) can cause heavy losses in the fields.

In storage, bruchids will give 90–100% loss if not controlled. This is the primary reason why cowpeas and mungbeans are not grown more.

Spittle bugs are an occasional problem attacking the junction of stem and pod.

Citrus. Soft brown scale on limes.

Mites are severe in most areas and require chemical control.

Testminers cause leaves to curl and interfere with photosynthesis, but the effect on yield is unknown.

Banana. Banana weevil is occasionally a serious pest, as well as root nematodes.

Coconut. Rhinoceros beetle larvae tunnel beneath sheath; serious pest throughout irrigated areas.

Watermelon. Melonfly larvae tunnel in fruits which become distorted and often spoil.

Sugarcane. Primary pests are whitegrubs feeding on roots.

Tomatoes. Tomato whitefly transmits a virus disease which can wipe out entire crop.

Onions. Thrips cause leaves to dry out and bulbs are reduced in size; can wipe out an entire crop; almost always requires chemical control.

Peppers. Fruitfly.

Cotton. Heliothis armigera and pink bollworm in combination can destroy a crop.

Pests of Dryland Crops

Sorghum. The primary pest is *Chilo partellus,* plus *Sesamiae cretica;* 100% of fields are infested. Though the level is variable it can reach 100% of plants.

Shootfly — recently found in Mogadishu, not reported elsewhere.

"Red feather" mite infestation can seriously reduce yields (according to farmers). Its attack occurs prior to the milky stage. It is a major problem in the dry season.

Cowpeas and Mungbeans. Same pest status as in irrigated areas.

Occasional outbreaks of armyworm.

Responsibility for Control

Owners of banana plantations take care of banana pests, primarily using Furad.

The Plant Protection Agency is responsible for dealing with outbreaks. It is instituting a programme for the sale of insecticides in small packages for application by farmers.

CROP PEST CONTROL IN SUDAN

Hassan Farag

The Situation in 1986–87

The yield of sorghum was very high. The pests which caused some concern were locusts, birds and rodents. There were no serious problems from sorghum bugs, American bollworms and stemborers.

There was no serious insect damage on sesame.

Cotton pests were not included in last year's report because we understood the meeting was concentrating on food crop pests. Cotton pests in Sudan are the whitefly *(Bemisia tabaci),* American bollworm, *Heliothis* spp., fassids and aphids.

Whitefly infestation was low compared with previous years, but there was more aphid infestation.

Manpower and Training

A pest control workshop was organised by the Agricultural Research Corporation (ARC) of Sudan. The main emphasis was on cotton pests, and the recommendations were mainly aimed towards more research on integrated pest management and less chemical use.

Many research entomologists with good experience are available; the constraint on pest management research is lack of funds. However, training graduates to M.Sc. levels in biological control is necessary.

Visits by scientists to ICIPE will be helpful, especially to those working on varietal resistance to stem-borer and crop loss assessment.

PESTNET Activities

The main activity of the PESTNET coordinator was in explaining the ideas and objectives of PESTNET to research entomologists in Sudan, and how it can help them in their pest management research. The first issue of *PESTNET TODAY* was circulated within the ARC, but more copies are needed to reach scientists in other organisations.

1. Crop loss assessment. Sorghum is the main food crop in Sudan, and many pests attack it and cause heavy losses (summarised in the proceedings of the PESTNET Working Group in 1986). Nevertheless there is no research on loss assessment in sorghum, either from insects or vertebrate pests. This is where PESTNET can play a great role, and the forthcoming assistance in this matter from the Tropical Development Research Institute, London, will also be welcome.

2. Varietal resistance to the stemborers. S. cretica *and* C. partellus. The research on the control of stemborers of sorghum has been concentrated on screening pesticides, but in view of the difficulties of chemical control, the identification of resistant varieties will also be desirable. Some work has been carried out in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to find lines with resistance to insects. The programme for this project has been ready for some time, but financial support is still being sought.

LIVESTOCK PEST SITUATION IN THE SUDAN

O.M. Osman

The geographical situation of the Sudan provides a unique ecological complex of livestock pests. The tick species spectrum has a north-south gradient coinciding with the rainfall pattern, starting with four species in the north and ending with about 64 species in the south, infesting domestic livestock and game animals.

The tsetse fly in the south has its own belt and collaterals with their own special ecology, seasonal density and host relations.

In view of the complexity of this situation, livestock pest control may present a burden on the country's resources. Therefore research on control activities is viewed from certain strategic angles.

Ticks

There is a great measure of host-parasite balance between ticks and indigenous livestock. This also provides enzootic stability for tick-borne diseases. This stability is occasionally disturbed by malnutrition.

In this type of situation the policy is to minimise interference through chemical control. However, we hope to obtain data through intensive surveys which may enable us to utilise existing ecological conditions to enhance tick control. By creation of the necessary tick awareness among nomads, and helping them to improve their husbandry and management systems, we hope to stabilise the balance of host-tick relations.

This balanced relationship is not, however, an accepted fact and it is intended to test the validity of such situations, especially the indirect effects. For instance, the effect of tick-borne diseases on the immune responses of animals to bacterial and viral vaccines is to be examined.

In the development of animal farming and the expansion of the dairy industry in Central Sudan a unique situation has been created by the introduction of pure, or improved, blood providing animals which are more susceptible to tick-borne diseases than the indigenous breeds. In these situations, our research strategies are aimed at:

1. Monitoring tick infestation on the farms in order to obtain appropriate ecological data, and then utilise such data in the improvement of tick management.
2. The establishment of an appropriate chemical control policy which will take into consideration economic benefits, pollution and the development of resistance. We therefore aim first to establish laboratory tests on acaricide resistance in order to procure the baseline data needed for these studies. We also ensure that safety recommendations for the use of commercial acaricides are adequate.

Tsetse and Trypanosomiasis

Tsetse and trypanosomiasis drain the country's resources in the south, east and west. There is no control programme, but a survey near the easterly border with Ethiopia provides useful data.

Surveys are also being conducted in the south-westerly areas, on the northern fringes of the main tsetse belt, where a great overlap of livestock takes place. Manipulation of various fly-round techniques and trapping, using various traps, is in progress. There is also a programme to study the degree of trypanotolerance of zebu breeds of indigenous cattle.

These are profiles of research programmes which we kindly hope to be supported by PESTNET:

1. Provision of traps for tsetse to boost the survey programmes.
2. Provision of statistical analysis facilities for our baseline data.
3. Training, especially at the middle level.

LIVESTOCK PEST RESEARCH IN ZAMBIA BY THE NATIONAL COUNCIL FOR SCIENTIFIC RESEARCH

J.C. Nondo

Livestock pests and the diseases they transmit limit livestock production greatly. The important pests are ticks and tsetse flies. The following organisations are involved in pest research:

- The Livestock and Pest Research Centre of the National Council for Scientific Research (NCSR)
- The Department of Veterinary and Tsetse Control Services (DVTCS) of the Ministry of Agriculture and Water Development
- The FAO/Southern African Development Coordination Committee (SADCC), Animal Trypanosomiasis Regional Training Centre
- Medical pest research is done at the Tropical Diseases Research Centre, Ndola.

Almost 70 species of ticks occur in the country and the following genera (with the number of species in brackets) have been recorded:

- Soft ticks (Argasidae) — *Argas* (2), *Ornithodoros* (2), *Otobius* (1)
- Hard ticks (Ixodidae) — *Amblyomma* (10), *Aponomma* (3), *Boophilus* (2), *Dermacentor* (1), *Haemaphysalis* (5), *Hyalomma* (1), *Ixodes* (14), *Rhipicentor* (1), *Rhipicephalus* (27).

Fifty of these species have been described in detail and illustrated, mainly using scanning electron microscopy, in a monograph of which the manuscript is almost complete. Other relevant information is summarised in relation to their distribution in Zambia as well as in Africa South of the Sahara and, where known, their biology and economic importance. Another publication more related to their ecology is being revised.

Current work involves reassessment of the specimens which have been collected from all over the country, particularly in the light of fresh taxonomic findings. For example *Rhipicephalus zambeziensis* and *R. lunulatus* have been recently identified as separate species from *R. appendiculatus* and *R. tricuspis* respectively.

Tick Colonisation

A total of ten species are kept at the NCSR laboratories to satisfy various research activities. They are: *Amblyomma variegatum, A. sparsum, Boophilus decol-*

oratus, Hyalomma rufipes, H. truncatum, Ornithodoros moubata, Rhipicephalus appendiculatus, R. evertsi, R. sculptus and *R. zambeziensis.*

Tick Biology
Various organisations are carrying out research on population dynamics of ticks under field conditions and survival and development under different microclimates. They are assessing the impact of ticks on livestock productivity, particularly in the traditional sector, in view of the fact that in Zambia 2.2 million of the 2.7 million cattle are owned by traditional farmers.

Disease Diagnostics
Systematic research on tick-borne diseases only started recently with the establishment of modern facilities at the Central Veterinary Research Institute at Balmoral (CVRI). There is work on anaplasmosis, theileriosis, babesiosis, heartwater and trypanosomiasis.

Tick Control/Acaricide Research and Extension Services
This is a possible area of collaborative research in the near future. Current work includes studies on the efficacy of pesticides in the environment and alternative approaches to tick control. The objectives are:

1. To evaluate the impact of chemical control measures aimed at ticks affecting livestock production.
2. To study in depth the phenomenon of the development of tick resistance to acaricides and help farmers to manage their spray races and dip tanks properly.
3. To develop alternative approaches to tick-borne disease control such as the use of immunogens, pheromones etc.
4. To develop new acaricides described from indigenous plants.

Tsetse Research
This is another area of possible research, especially in ecological studies. There are four main species of tsetse flies: *Glossina morsitans, G. pallidipes, G. brevipalpis* and *G. fuscipes.* Forty percent (300,000 km^2) of Zambia is infested. The incidence of human sleeping sickness has normally been low, being restricted to a few foci only. Because of this, the main effort in tsetse control in the past has been directed at trypanosomiasis in cattle.

There has been only limited success in previous tsetse control operating mainly because of inability to guarantee funding for follow-up operations to consolidate gains made. We are now turning away from the old control methods of ground spraying of persistent insecticides like DDT and Dieldrin, destructive holding lines and expensive fencing. These methods are being replaced by more "environmentally acceptable" methods in the form of odour-baited targets and traps, aerial spraying of nonpersistent insecticides, and the sterile insect technique (SIT).

The two main tsetse control projects are currently:

1. The application of SIT to control a pocket of *G.m. centralis* in the Central Province. This project is funded by the International Atomic Energy Authority (IAEA).
2. The Regional Tsetse and Trypanosomiasis Control Programme (RTTP) funded by the European Economic Community (EEC). Spraying operations will start in July 1987.

Pesticide Usage in Zambia
In December 1986 the Entomological Society of Zambia organised a National Symposium on Pesticide Use in Zambia. In view of the absence of a pesticide control board it was resolved that such a board should be formed immediately. Consequently a multidisciplinary Working Group was appointed to work out a *modus operandi* for the Zambian Pesticide Control Board.

Discussion
It was observed that the content and nature of information of country reports varied, and lacked uniformity. It was agreed that a standard format should be devised by the Secretariat and guidelines should be provided to country representatives inviting them well in advance to prepare their country reports, even if they would be unable to attend the annual forum themselves or if their countries were not going to be represented.

In his report, the Zambian delegate had indicated the development of acaricide resistance in ticks, and confirmed to the conference that resistance was mainly to chlorinated hydrocarbon compounds.

The Secretariat was advised to record the problems raised in country reports, analyse them and try to assist the countries concerned in finding answers to them.

In response to an observation on availability of information through PESTNET, members were informed that the Network's proposed information management system was meant not only to disseminate the information but also to facilitate proper utilisation of the information available.

National delegates were commended for their efforts to keep track of developments in their countries and present the information which proved useful in planning PESTNET activities.

6 ANNEXES

ANNEX (i)

PROGRAMME

THE FIRST ANNUAL PESTNET CONFERENCE
NAIROBI, 27–30 APRIL 1987

MONDAY, 27 APRIL	
0800–1800	PESTNET delegates participate in the ICIPE Annual Research Conference
TUESDAY, 28 APRIL	
0810–1830	PESTNET delegates participate in the ICIPE Annual Research Conference
WEDNESDAY, 29 APRIL	
0810–1730	PESTNET delegates participate in the ICIPE Annual Research Conference
THURSDAY, 30 APRIL	
	First Annual PESTNET Conference
CHAIRMAN:	Dr. R.C.J. Mkandawire
RAPPORTEURS:	Dr. J.K.O. Ampofo Ms. Mary H. Bugembe Dr. M.E. Smalley
0830–0840	Chairman's Introductory Comments
0840–0900	PESTNET Progress Report (Z.M. Nyiira, PESTNET Coordinator)
0900–0920	Discussions
0920–0930	Group Photograph (in front of Guest Centre)
0930–1000	Tea/Coffee Break
1000–1130	Country Reports:
1000–1010	Burundi *(Dr. P. Ndayiragije* and *Dr. J. Niyongabo)*
1010–1020	Kenya *(Mrs. F. Olubayo* and *Dr. R.M. Injairu)*
1020–1030	Malawi *(Dr.R.C.J. Mkandawire)*
1030–1040	Rwanda *(Dr. D. Kayitare)*
1040–1050	Somalia *(Dr. A.H. Hassan* and *Dr. F. Nur)*
1050–1100	Sudan *(Dr. H. Farrag* and *Dr. O.M. Osman)*
1100–1110	Tanzania *(Mr. C.S. Tarimo)*
1110–1120	Uganda *(Dr. Y. Ssentongo)*
1120–1130	Zambia *(Dr. I. Kaliangire/Dr. K.N. Rao* and *Dr. J.C. Nondo)*
1130–1230	Discussions
1230–1400	Lunch

1400–1500	Cooperation and Linkages; initial programme of activities 1. Research and development programme 2. Methodology workshops 3. Training (ARPPIS, FAMESA) 4. Fund raising for collaborative activities
1500–1545	Information Flow: 1. Newsletter 2. Annual PESTNET Conference 3. Framework for data release protocol for sharing information
1545–1615	Any Other Business

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