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ANIMAL AND PLANT DISEASE AND PEST MONITORING FOR THE CARIBBEAN REGION

PROCEEDINGS OF A REGIONAL WORKSHOP

Port of Spain, Trinidad
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Edited by

Barry Stemshorn and Theresa Bernardo

IICA Office in Trinidad and Tobago

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To be added here when written

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I. OPENING SESSION

Chairman: Dr. Vincent Moe

INTRODUCTORY REMARKS

by

Chelston W.D. Brathwaite
IICA Representative in Trinidad and Tobago

Mr. Chairman, distinguished Permanent Secretary, Directors of IICA's Animal Health and Plant Protection Program, Delegates of the Countries of the Caribbean, distinguished guests, ladies and gentlemen:

I am indeed pleased to have the honour and the privilege of addressing this distinguished audience attending this regional seminar/workshop on Animal and Plant Pest and Disease Monitoring in the Caribbean.

I welcome all of you on behalf of IICA.

This workshop is being held at a time in the Caribbean when the region as a whole is reassessing the role of the agricultural sector in national development and is seeking to weather the economic storms of our day by diversification and redirection of the sector.

The CARICOM Secretariat in collaboration with our own Institute is in the process of developing a comprehensive agricultural sector plan which reviews the previous experience of agriculture in the region and seeks to delineate a new course for the sector. I would like to quote from the agricultural sector programme of CARICOM this morning in order to make a point.

In the section of the document on regional policy trends and experiences (Part I Section 3.2) the document notes, and I quote:

> "Export agriculture was generally neglected despite the welcome contributions this sector could and did make to providing foreign exchange. Attention, where it was provided, was primarily focused on securing preferential access for those products traditionally receiving it, and pursuing it for other major crops which might have emerged.
>
> In this scenario domestic agriculture was perhaps

the most neglected sector of all, and not surprisingly the Region moved from food-surplus to deficit in this period. It is estimated that it is currently importing in excess of US$1 billion in agricultural produce.

Our individual country review indicated that the continued world crisis, mounting external indebtedness, balance of payments and foreign exchange difficulties, fiscal pressures, and the slowing down of social advances seem to have led to a re-evaluation of these policies.

The position has emerged that if agriculture is to play a leading role in reactivating expansion, then emphasis needs to be placed on such strategic considerations as a thrust towards diversification; the promotion of inter-sectoral linkages, market improvements and efficient systems of finance and credit; and the development of an organic indigenous technology. It is within this context, therefore, of a new phase of agricultural development that the Programme is framed. Such a new phase is premised on the re-evaluation and re-direction of public and private policy. The programme's emphasis on domestic agriculture, non-traditional exports, the transformation of the end uses of traditional products, science and technology especially in the area of the new technology, agro-industry and domestic input-output linkages; and the regional cooperation is based on this perspective".

This new agricultural development thrust visualizes decreased trade in primary agricultural products and a livestock sector that is modern and efficient and designed to reduce the high food import bill currently associated with imported livestock products.

Clearly, Mr. Chairman, the planners are signalling a new era in Caribbean agriculture where technology and information will be important building blocks in the construction of a new agriculture. But these dreams will not be achieved unless and until the institutional structures for the delivery of the information and the technology are substantially strengthened.

We in IICA are fully cognisant of the need for institutional strengthening mechanisms and are aware that these are particularly important in the Caribbean because of the small size of our islands and the limited technical and financial resources available.

Mr. Chairman, in organizing this seminar/workshop not

only are we bringing together the representatives of fourteen countries of the region for dialogue and consultation but we are also fostering linkages between the disciplines of plant protection and animal health in this region - a relationship which as far as my memory serves me - has not been explored before. We feel certain that there are benefits to be derived from this relationship and later the Director of our Programme will discuss some aspects of this joint approach.

It is within this context, therefore, that we are pleased to cooperate with the Ministry of Food Production, Marine Exploitation, Forestry and the Environment of Trinidad and Tobago in sponsoring this regional workshop which represents the beginning of a project which is designed to strengthen the institutional mechanisms for provision of reliable animal health and plant protection information and to create regional linkages for effective utilization.

There is little need to re-emphasise that pests of animals and plants continue to create some of the most intractable problems in our agriculture and we must at all times seek solutions not only from within but we must also draw on the relevant experience of those outside our region. In this context, therefore, I am very pleased to welcome our guests from the University of Guelph, Agriculture Canada, the United States Department of Agriculture, the University of Prince Edward Island, and North Carolina State University.

A significant portion of the funds for this seminar and for the project is derived from the Canadian International Development Agency (CIDA) in a special contract agreement with IICA. We are indeed grateful for such assistance and cooperation.

I hope and wish that this seminar will be a rich, memorable and productive experience and that it will result in the provision of the information and technology building blocks to construct a new Caribbean Agriculture in the 1990's and beyond.

OPENING ADDRESS

by

E. Patrick Alleyne
Permanent Secretary, Ministry of Food Production
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IICA Representative in Trinidad and Tobago, Representative of the Canadian High Commissioner, Distinguished Representatives of UNDP, FAO, and our regional Institutes, Participants, Ladies and Gentlemen:

I am indeed happy and feel quite honoured to be allowed to attempt to fill the gap for the Honourable Minister on the occasion of the commencement of your two-day workshop on Animal and Plant Disease and Pest Monitoring for the Caribbean Region.

Let me firstly, on behalf of the Government of the Republic of Trinidad and Tobago, extend a very warm welcome to the distinguished resource persons and the participants (fourteen countries) visiting with us from abroad, especially those of you who may be doing so for the first time.

The objectives of this workshop fit comfortably within the framework of activity which relates to what is known as Programme V of the Inter-American Institute for Cooperation on Agriculture. In addition, it is important to draw attention to the fact that the workshop is an activity which relates to the project entitled "Plant Disease and Pest Information Systems" which was endorsed by the Ministers responsible for Agriculture in the region at their meeting in May, this year.

Let me therefore, at this time, congratulate IICA for what we may call effective and timely delivery.

There is no doubt concerning the relative importance of this project, and of course this workshop, to our CARICOM region. As a matter of policy, Trinidad and Tobago is pursuing the significant reduction of a staggering food import bill which peaked at TT$928.8M in 1983, and was still as high as TT$834.8M in 1987. Our CARICOM region, as a whole, is no less burdened, striving for a higher level of food self sufficiency and food security, the overall food import bill now approximately some EC$2 billion per annum.

Increasingly so, our countries cannot really afford the cost of sustaining these levels of imports; and, in the prevailing economic situation such as is typical of our region, we need to be able to allocate scarce resources to other pressing and competing aspects of the development process, not the least being "agricultural modernization and diversification" - which according to the 1987 Ottawa Declaration of Ministers of Agriculture for Latin America and the Caribbean ... "must constitute a key element of strategies for economic revitalization and development in our countries".

The modernization cum development process of the agricultural sector inevitably aims, *inter alia*, at:

- increasing production and productivity of crop and livestock activity; higher and better yields per unit of land becoming increasingly critical especially in our island states;

- increasing areas under production, where feasible;

- production of non-traditional crops; especially in search for expanded international trade and the earning of foreign exchange;

- extending and deepening the agro-industrial thrust, utilizing appropriate technology such as will promote integrated rural development in the context of our inherent resource situation.

Maximising the effects of our development thrust necessitates due attention to effective measures for the prevention, control and/or treatment of the various plant and animal diseases and pests of which we are already aware, and those that we are likely to encounter.

In Trinidad and Tobago, we are constantly on the alert against the introduction of Foot and Mouth Disease, Rinderpest, the Coffee Berry Borer and the Mango Seed Weevil - to mention a few of these diseases and pests.

Recently, however, the African locusts have invaded many of our territories. Within the past decade, we have been crudely reminded of the vulnerability of our region, given the constant movement of plant and animal products for a variety of reasons. The coffee berry borer and coffee rust are now in Jamaica; the Oriental fruit fly is in Suriname; blue mould of tobacco is in Cuba, the coconut mite is throughout the region.

I understand that with the presence of Africanised bees in South America and in Trinidad and Tobago that we are very likely to see in due course the dreaded Varroa mite, a very serious pest of bees.

The increasingly extensive exchange or transfer of genetic material between countries, with and without appropriate quarantine arrangements, increases the risk factor of the movement of pests and diseases into and through the region.

We are therefore caught up in a battle without end against pests and diseases.

My information is that development of a plant and animal information system is a major undertaking fraught with all types of difficulties, and which have posed problems even to developed countries like Canada and the U.S.A.

I am, therefore, pleased to see the effort, including the related research, which has already been put into the feasibility study which has, to some extent, informed the present Project.

Over the next two days, I note that the participants will be presented with an overview of selected systems that have been established in Canada and the U.S.A. A careful and critical analysis of such systems in the context of the individual country's plant and animal health status, physical and social infrastructure, institutional framework, and the prevailing human and financial resources, are necessary for the adaptation and transfer of such technology, as may be appropriate, to the needs of our respective countries.

In addition, we need to remember that for any proposed system or programme to be meaningful and effective, the results must be readily accessible to the producers. Thus, emerging recommendations must be initiated and designed with priority concern for the farmer and must be in harmony with the country's needs, thereby facilitating acceptance by a broad-based target group of users.

The review of those selected systems along with the discussions that will take place on the feasibility study conducted by the multi-disciplinary team of epidemiologists and clinicians of the School of Veterinary Medicine, North Carolina State University, should facilitate our identification of National priorities and projects on disease and pest surveillance and information systems.

While we are aware, in a general sense, of the impact of pests and diseases on production and the benefit of treatment or prevention procedures, there is much subjectivity to our

overall conclusions in the region. The December, 1985 Report of the World Resources Institute on "Pesticide Subsidies in Developing Countries" concludes that neither the countries which spend large sums on subsidy programmes for pesticide use nor the international development agencies have studied the economic and environmental consequences. The report also suggests that, in many instances, the operational subsidy programmes may be inconsistent with the objectives of safe and rational pest management set forth in generally accepted guidelines; that farmers rely much more than is necessary on chemical applications, the result being that efforts to promote the most cost effective methods of integrated pest management are undermined.

The limited territorial space and fragile ecosystems of our island states necessitate that we maintain a high level of sensitivity on these issues. I trust that this project will also apply some resources to matters of this kind; that is to say, there will be no lack of concern for ways and means of protecting our environment.

At this time also, virtually every territory of the region is trying to explore regional and extra regional markets for our agricultural and horticultural products. In this regard, we consider this project to be especially significant, and anticipate meaningful assistance and collaboration with the appropriate national specialists in their efforts to ensure that our products meet the standards of our target markets. Our products must not be seen, even suspected, to be a possible threat to the indigenous crops, livestock and human population in the countries to which we export.

I expect that the managers of this workshop will ensure the minimum of distraction from the main issues; that the participants will exploit to the fullest the potential for meaningful dialogue and analysis of issues, such as can flow from the pooling of ideas and experiences by such a distinguished group of scientists.

The Government, and my Minister, in particular, wish to extend very sincere thanks to IICA and Member States of CARICOM for the selection of Trinidad and Tobago as Headquarters of the Project. We are all happy over the fact that IICA has committed substantial funding for the next four years.

Since Trinidad and Tobago now holds the position of Chairman of the Standing Committee of Ministers responsible for Agriculture, may I also indicate our appreciation to CIDA for assistance with this regional project, your agency having committed a sum in excess of US$300,000.

Our Ministry is pleased to be cooperating in the effort. Be assured of our commitment and sustained cooperation. I wish Dr. Stemshorn, the Consultant, good luck in his special responsibility; to the indefatigable IICA Representative, Dr. Brathwaite, thanks again.

Ladies and Gentlemen, I trust your deliberations will be challenging and fruitful. It is with great pleasure that I now declare open this Workshop on Animal and Plant Disease and Pest Monitoring for the Caribbean Region.

OBJECTIVES AND PROGRAMME OF THE WORKSHOP

by

Barry Stemshorn, Co-ordinator
Animal and Plant Disease Monitoring Project
IICA Office in Trinidad and Tobago

We are here today and tomorrow because Governments of Caribbean countries have identified a requirement for improved information on plant and animal diseases and pests in order to reduce constraints to the production and to the international marketing of crops and livestock.

In 1986, the Caribbean Community's Standing Committee of Ministers Responsible for Agriculture mandated the CARICOM Secretariat to strengthen national plant quarantine systems and to establish pest and disease information systems.

With regard to animal health, the Caribbean chapter of the Inter-American Commission on Animal Health, composed of Animal Health Directors of the Member States of IICA resolved in November, 1984, to support the development of an animal health information system for the region.

In response to these directions, IICA presented a project proposal to the Ministers Responsible for Agriculture at their meeting in Port-of-Spain earlier this year. This project, which the Ministers approved, will bring together the resources of the eleven participating governments, the University of Guelph through support from the Canadian International Development Agency, and IICA. At the request of the Ministers, efforts are being made to secure funding for three additional participants, Belize, Montserrat and St. Kitts/Nevis.

The proposal approved by the Ministers called for participants to apply techniques for disease and pest monitoring based upon those used in other countries, with modifications to meet specific needs of the region. It also included the creation of a centre of expertise in Trinidad and Tobago to support the national participants. In response to a request from the Minister, efforts are being made to secure funding for three additional participants, Belize, Montserrat and St. Kitts/Nevis.

Let me now turn to the specific objectives and program

of our workshop.

The first objective is to review selected animal and plant health monitoring systems in North America and the Caribbean.

This morning we will hear from North American pioneers in this field. We are grateful to the United States Department of Agriculture, Agriculture Canada and the University of Prince Edward Island, for making their staff available.

I would point out that by presenting these North American systems we are not suggesting that these should be duplicated in the Caribbean. Rather, we seek to learn from the experience of these speakers and to draw on their counsel during our discussions on how to proceed in the circumstances faced by agriculture in the Caribbean.

I encourage these speakers to share not only their successes, but also what one of them has called the "learning experiences".

This afternoon Drs. Anderson and Pollard will turn our attention to animal and plant health information studies in the Caribbean, and on Friday morning we will hear from the national spokespersons about projects underway in their countries.

Our presentations this afternoon will also contribute to the second objective of the workshop, which is to consider recommendations for disease and pest monitoring activities in the Caribbean region.

We will begin by hearing recommendations from a feasibility study in the area of animal health conducted for the CARICOM Secretariat by a team from the University of North Carolina. This study was done under a contract with IICA which was funded by the International Development Research Centre of Canada.

Dr. Pollard from the University of the West Indies will then make some important observations on the need for improved information on plant diseases and pests in the Caribbean.

Finally, to close the afternoon session, on behalf of IICA and our collaborators from the University of Guelph, I will propose a strategic framework for our efforts to strengthen monitoring systems in the region. This would include a network of epidemiologists and a series of model "mini" projects. We suggest that this approach would allow us to accommodate diverse national requirements and priorities

to be described later in our workshop. In accordance with a recommendation from the "North Carolina" study, and the project approved by the Ministers, these activities and the model projects would be supported from a regional centre of expertise in Trinidad and Tobago. This centre would provide microcomputers and software, expertise and training in epidemiology and project management, and would facilitate networking activities.

I would take this opportunity to introduce 3 colleagues from the University of Guelph who will be supporting the development of this regional centre, funded by the Canadian International Development Agency. Dr. Wayne Martin is Chairman of the highly regarded Department of Population Medicine at the Ontario Veterinary College. We are very pleased to be working with this widely respected group of epidemiologists. Dr. Martin has been asked to prepare an overview and critical synthesis of our presentations and discussions today and tomorrow. This will be presented, along with the draft report of the meeting, on Friday afternoon, and will help focus our final discussions. Also on the Guelph team, Dr. David Waltner-Toews will lend his expertise in epidemiology to our work, and will manage the Guelph contribution to the project. Dr. Theresa Bernardo will be stationed at our office in Trinidad and Tobago to provide epidemiological support to the national projects.

Returning to the agenda, a third and most important objective of the workshop is to identify and consider the specific disease and pest monitoring priorities of the participating governments. On Friday morning we will hear from the national spokespersons regarding their requirements and how these might be addressed.

Our fourth and final objective is to build on a unique feature of this workshop, and indeed the project of which it is a first step. This is the opportunity for specialists in livestock and plant health to learn from each other in many fields of common interest. These include survey, statistical and data processing methods, quarantine and disinfection procedures, methods for rapid detection of microorganisms, planning for disease control emergencies and international negotiation of phyto/zoo-sanitary conditions for trade.

I hope that you will find the workshop stimulating and useful.

NEED FOR DISEASE/PEST INFORMATION AND REFLECTIONS ON A COMMON PLANT AND ANIMAL APPROACH

by

Harry Mussman, Director of Program V
Inter-American Institute for Cooperation on Agriculture

Distinguished guests at the head table; delegates from animal and plant health programs from the subregion; and friends; we meet here today for an historic event: the first meeting of Directors of Animal Health and Plant Protection from essentially all the countries of the English-speaking Caribbean. And I am delighted to have been asked to make some comments during this opening session.

The topic suggested for my remarks gives me considerable latitude and I shall take advantage of it. Needless to say, I believe strongly in the importance of an animal and plant health information system, not so much for the sake of information itself, but for what it can tell us and how and by whom it might be used. In various ways the end users of an information system are the producers of livestock and crop commodities, the managers of the animal and plant health programs themselves and officials in the Ministries of Agriculture, Planning or Economics. Each can put to good use the information collected provided it is analyzed intelligently and disseminated on a timely basis. The Information System being discussed during this workshop should give us a good base from which to start because the delegates from all the national programs are here to help design it, to define its purpose and to determine how to make it work.

Yesterday I was priveleged to sit in on a halfday session of Directors of Plant Protection from the OECS countries discussing their respective quarantine programs. It was mentioned repeatedly by each Director that more information was needed in order to do his or her job effectively and efficiently. The type of information needed by quarantine personnel differs from that which would be important to citrus or banana growers or to a Ministry official but, properly designed, an information system can eventually meet the needs of all these diverse users.

But, you may ask, why are we talking about a combined animal and plant health information system? Why not deal with

each separately? We think we have some good reasons for proposing a combined system but we also readily acknowledge that some countries may decide that one or the other has greater priority or they simply have a preference for developing individual systems.

There are several reasons why we are proposing a combined system and I would like to share them with you. First off, I am certain that as Directors of Animal Health and Plant Protection Programs you have been struck by the fact that not only do both have the same objective - to protect the country's agriculture production - they also have in common many operating components. In fact, conceptually the basic animal health program and plant protection programs are the same.

Think about it. Each relies on a quarantine program to prevent the entry of diseases or pests exotic to the country. One set of inspectors at ports of entry or land borders can serve the purpose of both programs if they are properly trained.

Each relies on diagnostic support to identify pests or diseases, particularly in backing up quarantine activities. Though a veterinary laboratory operates somewhat differently than an insect taxonomy lab, the microbiology and virology needs are much the same, as are the central services.

If a new, economically important disease or pest enters a country there should be a mechanism in place to respond to the emergency - to identify and contain it until such time as a decision is made to eradicate it or to live with it. The technology used differs for plant and animal diseases and pests but the philosophy guiding the approach to dealing with them is the same.

When we talk about the basic domestic programs - those that deal with endemic problems - we see some differences, primarily because of technology available, environmental considerations or economic factors. In both animal and plant health, however, the underlying philosophy is, or should be, to allocate resources and efforts to those diseases or pests that have the most serious economic impact on production or productivity. It is in relation to the decision making regarding disease and pest priorities that an information system would enjoy its greatest visibility.

Finally, the management component of the animal health and plant protection programs can be one and the same - after all, although it is extremely useful to have a technical

background to lean on, the manager must use an entirely different set of skills in administering human and financial resources and overseeing all the support activities necessary to deliver effective field programs.

From the foregoing you can see that combining animal and plant health programs makes sense, if for no other reason than to avoid duplication. But there are, in addition, other benefits. Chief among them is the fact that by joining forces the program covers all agricultural production and has more influence on policy. Ministries find it difficult to deny that effective agricultural health programs are important. When economies of scale in cross-training, laboratory services and administrative support are factored-in, the rationale becomes very persuasive.

But, to come back to this meeting, all I've just talked about reinforces the combined animal and plant health approach to a subregional information system. The interviewing process for collecting data, the analyses and information feedback can all be managed by one unit, provided the personnel are adequately prepared. Considering animal and plant health program status in the Caribbean subregion we believe it would be more productive to start with an animal health information system and later incorporate plant protection programs. However, the latter programs' entry into the system cannot be delayed too long when we consider that crop diversification and increased production are acknowledged priorities in every one of your countries. Knowing what pests and diseases are present and what obstacles they present to achieving these priorities requires that actions to establish the information system be undertaken as soon as possible.

Having heard what Trinidad and Tobago's Permanent Secretary of Agriculture told us earlier we know the agricultural leadership of the Caribbean countries is well informed. They know an information system is important to achieving their goals. It is now up to us to work out the design and strategy that will permit us to meet the expectations of the Ministers responsible for Agriculture. The combined Information System to be discussed today and tomorrow will be your System - let's get on with making it a reality. IICA, with the welcome support of Canada, stands ready to work with you to develop the System to serve your needs.

REPORT ON SESSION II

by

Gene V. Pollard, Entomologist
The University of the West Indies
St. Augustine, Trinidad

Four papers were presented, each giving an overview of various animal and plant health information systems in the USA and Canada.

1. Mr. D. Talpas of USDA-APHIS outlined the US National Agricultural Pest Information System (NAPIS). This system was developed in 1982 and evolved from systems which had been set up over times past.

   NAPIS essentially consists of a programme for detection and survey of pests as well as a data base management programme. This system co-ordinates information from 50 states and contains 3 million records at present.

   Mr. Talpas emphasised that it was important to establish:

   (i) What do you want out of the system? What are the goals?

   (ii) What is the quality of information in the data base? A check system was devised to allow the generators of information in the individual states to immediately check the data input.

   Mr. Talpas identified a number of other factors which were important for the efficient functioning of the system. Some of these were:

   1. The identification of State Co-operators

   2. Annual meetings of persons from all states, where a work programme was developed for the coming year.

   3. Proper documentation. Some documentation was made available and included:

      "NAPIS" User's Guide
      "Goals and Objectives of NAPIS"

2. Mr. D. Gray of Agriculture Canada outlined how his unit is organised and the development in Canada of plant

protection and pest risk studies. An important point was made of the need to be able to collect and evaluate the necessary information to allow for adequate pest risk studies. Mr. Gray emphasised the difficulty in the manual manipulation of data.

Mr. Gray further described nine information systems present in Canada. These included, for example:

- Regulatory systems for import, domestic and export agriculture

- A system for plant introductions

- A system for passenger baggage inspection

- A system for certifying seed potato, etc.

Finally Mr. Gray described Canada's involvement in international co-operation with regard to the development of data bases.

3. Dr. J. Farrar, US National Animal Health Monitoring System (NAHMS).

Dr. Farrar outlined the development of NAHMS pointing out the superiority of NAHMS over previous systems all of which suffered from two major drawbacks - their inaccuracy in collecting data and the fact that under reporting frequently occurred.

Dr. Farrar also described earlier Pilot Survey Programmes from 1982 - 1987 which have now given rise to the NAHMS-Core Programme. This programme now allows for co-operation between State and Federal authorities, producers, universities, etc. The NAHMS process was described from the planning and training phase to the selection of producers who are then asked to make certain observations. These data are then recorded with an eventual summary report going back to the producers to allow for herd improvement.

Important points arising out of Dr. Farrar's presentation were:

(i) To define and document objectives (short and long term) of any surveillance system

(ii) Plan a narrowly focused and well designed pilot project

(iii) Provide useful and timely information to all participants in the programme. There must be some form of feed back to the producers, for example

4. Dr. Dohoo, presented a framework for classifying surveillance and monitoring systems and described APHIN as a Passive, Volunteer, Service and Ongoing system.

A part of APHIN was a health management programme where information from farms went to veterinary clinics which in turn fed the data into APHIN computers. APHIN in turn reported back to the farmer.

Dr. Dohoo pointed out the time it took to have veterinarians become computer users and the importance of having all participants involved in the programme from the start of the project.

He also described two other programmes of APHIN - abattoir surveillance, which he thought was not relevant to the Caribbean at this time, and the central data base. The latter incorporated data from various sources for analysis, summarisation, distribution and long term storage of information.

Dr. Dohoo also emphasised not only the need for confidentiality of data but that participants in any programme must be reassured of this confidentiality. There was also the need to identify data sources.

Another important consideration was who would develop the particular system to be used.

Of all the various systems described it was apparent that these could be divided into Service systems and Surveillance Systems. APHIN, for example, was a Service System, while NAHMS was both essentially Surveillance and Service.

Dr. Waltner-Toews asked how feasible was it to combine both survey and service. Dr. Dohoo thought that this was very difficult.

The delegate from Antigua pointed out that in small countries, like in the Caribbean, officers have to carry out both service and survey operations and hence any system developed may have to combine both.

II. OVERVIEW OF SELECTED SYSTEMS

Chairman: Dr. Hector Campos

THE NATIONAL AGRICULTURAL PEST INFORMATION SYSTEM (NAPIS) TRACKING PLANT PESTS FOR TODAY AND THE FUTURE

by

David G. Talpas
National Survey Co-ordinator
USDA-APHIS-PPQ

Agriculture....the nation's biggest industry

Today, the American farm produces more than twice as much as it did in 1930. That increased productivity gives us more food for our money--and a wider variety of food choices. It also means we have more to trade on the international market. In fact, the United States exports more farm products than anyone else in the world. More than 20 million people work in some phase of American agriculture--from growing food and fibre to selling it at the supermarket. Farm assets totalled over $770 billion by the end of 1986, and the industry is still growing.

But each year, billions of dollars are spent controlling agricultural pests--insects, weeds, nematodes, and plant diseases that threaten our food and fibre crops. These pests may be native to the United States, such as the rangeland grasshopper. Others, like the Mediterranean fruit fly, may be introduced from other countries.

In any case, effectively surveying fields and farms is essential to detecting pests early for successful eradication and control. Pest surveys are important for other reasons too--states need current pest information to be able to direct research, monitor pest buildups, and help farmers improve crop yields.

But sharing that information across state lines--while of critical importance--can often be difficult. Unlike people, plant pests ignore political boundaries, moving easily from state to state. And survey methods for the same crop may vary widely from one area to the next. Until recently, there was no centralized system for collecting survey information so that it could be shared with other states. Since 1982, the United States Department of Agriculture has been working to coordinate and improve the survey program.

Now, their efforts have paid off.

USDA's Animal and Plant Health Inspection Service--APHIS--has developed a program which pits modern computer and communications technology against the age-old problem of agricultural pests.

The program is called NAPIS, which stands for the National Agricultural Pest Information System. This computerized data base collects, summarizes and standardizes plant pest information from all 50 states. NAPIS users can retrieve the latest information on pest conditions, along with host crops, weather conditions, and geographical locations.

NAPIS can be used by a variety of people with very different needs. By accessing the system, a plant pathologist in California can get information on a recent outbreak of leaf rust in the Midwest, a Missouri extension agent conducting a survey for potato leafhopper can find out how other states collect their data, a chemical company can determine how many observations for weeds in field crops were made last year, and an APHIS Plant Protection and Quarantine office in Florida can get a list of new insect finds for the whole state.

NAPIS attempts to tap into all the pest survey activities carried on in each of the states. Here's how the system works: Each state has a survey coordinator and a committee that develops a plan to determine which data will be entered into NAPIS. To ensure that the best expertise is available to the program, members of the state survey committee include specialists in entomology, plant pathology, weed science, and nematology.

APHIS' Plant Protection and Quarantine staff provide national coordination and work with the states to implement the system and monitor its progress. APHIS also provides some funding to the states to supplement their budgets, and has contracted with Purdue University to manage the database.

Each state cooperator conducts ongoing survey and detection activities to collect the data that go into NAPIS. They sample insect populations, detect weeds, and examine plants for disease. If an unfamiliar pest is found, they look to an insect, weed, or plant disease specialist for positive identification.

Survey findings are recorded in state computer databases and may include precise information on survey methods, results, and even the weather and time of day.

Next, the states transmit their data to the central NAPIS computer at Planning Research Corporation in McLean, Virginia, for storage and processing. By the following day, these records are available for access by any user in any state.

There are seven record types, containing a variety of individual data:

- CROP RECORDS contain information on the host crop of a particular pest
- LOCATION RECORDS list the geographical coordinates of the observation site
- WEATHER DATA RECORDS describe the weather conditions at the observation site, including wind speed, wind direction, and relative humidity
- GENERAL PEST RECORDS contain information on the specific pest occurrence, such as life stage, damage, and survey method used
- TRAP CATCH RECORDS contain information for trap surveys, such as trap operating days, trap type used, and number of pests trapped.
- DIAGNOSTIC LABORATORY RECORDS* generated when a sample requires laboratory identification, specify the laboratory where the sample was taken and the diagnostician who identified it
- BENEFICIAL ORGANISM RECORDS identify the beneficial organism, its host pest, the distribution of the pest, and other factors.

NAPIS can be a valuable tool to anyone who works directly or indirectly with agriculture. If you need information on:

- the distribution of a pest in the United States
- the abundance or damage levels for a pest
- the host of a certain pest
- the level of survey activity on a pest
- or the first-of-season occurrence for a particular pest then you may wish to join the NAPIS network

Some users need the information to monitor pests in neighbouring states. Others use it to track established pests, or to find out which areas are free of a particular pest. In 1985, for example, Iowa extension agents were able to track the migration of the black cutworm using NAPIS data. Personnel in surrounding states surveyed for the pest and recorded data on its occurrence. This information, together with weather data such as

wind and temperature, helped state personnel analyse where and when the pest would be moving. Their prediction of when the black cutworm would emerge was accurate to within three days of the actual emergence.

Most NAPIS users are currently located at land grant universities, state departments of agriculture, and state and federal plant protection offices. However, plans are already underway for expanding the NAPIS network. An on-line system will be set up so that private industry can access NAPIS on a fee basis.

Many companies could benefit from the information NAPIS offers. For example, a chemical manufacturer would be able to determine which insects to focus its research on to develop more effective pesticides. Funds generated from private industry's use could help expand and improve the system.

Colorful, computer-generated maps of pest movement and distribution are already being produced by individual states and this function of NAPIS will continue to be streamlined. These maps show at a glance where a pest is located and where it came from, making it easier to predict where it will move next.

A system for listing survey methods and a NAPIS user guide have been developed and will be supplemented as necessary.

NAPIS has grown tremendously since its inception in 1982, and is expected to expand even more. Computer technology will continue to improve, and more seekers of plant pest data will join the network.

But the future of NAPIS lies with the people behind the system. It will be their job to remain flexible, to adopt improvements as they become available, and to continue to develop ways to communicate plant pest data in a timely and efficient manner.

Such a forward-looking attitude surely will give NAPIS the capability to meet the ever-more-sophisticated needs of its users in the years to come.

PLANT DISEASE AND PEST SURVEILLANCE IN CANADA

by

David Gray
Associate Director Import Programs
Agriculture Canada

INTRODUCTION

It is indeed a pleasure for me to be given this opportunity to visit this much warmer part of the world and to participate in your workshop on pest surveillance and monitoring.

This is my first visit to Trinidad, however not my first experience with the subject of plant protection in this area, as I have studied and worked with several of your agricultural experts and officials over the past 30 years. In fact a Mr. Derek Outdit, one of your native sons, is presently a staff member of our Import Program in Canada. Derek brings to the job a wide spectrum of international experience in the production and marketing of agricultural commodities and is now adjusting to a whole new spectrum of temperate crops.

Despite the limited exposure, I would like to become more familiar with your country, learn something of your agricultural industry and your aspirations for future development. We hope that we can be of assistance to your organization and are prepared to make available any or all information, or materials that we have that may help in the further development and establishment of an information network system for plant pests and diseases for IICA.

I would like to make it abundantly clear from the outset that I am not a computer expert, or even an information management specialist as I would prefer to leave this field to those, who, for some reason or other find this discipline more fascinating than the world of plant protection. I am prepared, however, to contribute whatever little knowledge and experience I have accumulated over the past 30 years in the field of plant quarantine and protection in Canada and abroad. Some of this material may be of relevance to the project at hand. Without further delay, I will attempt to give you some impression of the past and present developments underway in Canada by Plant Protection with respect to information systems, the development

of pest risk analysis and the management of pest information in general.

Canada is presently attempting to develop a pest risk assessment system (PRA), one that will provide answers to some very complex issues. Answers that require the mixing and matching of known or interpolated facts. These answers will be displayed in numerical, digital or pictoral fashion. Many countries are attempting to develop similar systems and it is now abundantly clear that failure to modernize in this area will leave nations vulnerable to additional crop losses and the inability to compete in the market places of the world.

Such systems can be as simple or as complex as one may wish to make them, however, regardless of the nature and scope, certain basic facts will be common to all of them. They would comprise facts that would identify the pest organism for which an assessment must be performed, the plant or plant product host, the foreign origin of the pest, the trade pathways or means of transport, the presence of suitable host species in the country of destination, the infection pathways that would ensure introduction and establishment, the climate and other environmental factors of the destination country or parts thereof. These are common factors that would be found in any PRA system. Beyond that the degree of complexity is almost infinite.

A more complex system would address resistant varieties, disease races, means of domestic dispersal and survival, insect vectors, wind currents, irrigation, site of infection in the plants, symptom expression, time of attack, assessment of disease, crop losses, diagnostic characteristics and procedures, techniques (e.g. indexing), treatment and literature references.

The collection, organization, verification and automated manipulation of this information is essential if importing and exporting nations are to protect their agricultural and forest resources and maintain and improve the credibility of their phytosanitary certification systems.

Those countries with a history of importing plant and plant products normally control such movements through a system of regulatory controls that have changed little over the past twenty years. We are now witnessing some rapid and innovative changes in these areas.

Those countries dependent upon exports are now scrambling to satisfy pressures to reduce or eliminate tariffs and domestic subsidies and maintain and find new markets, justify phytosanitary import requirements, eliminate non-tariff trade barriers and maintain and enhance the credibility of export certification of goods sold abroad.

The developing countries are attempting to diversify their agricultural economies through the importation and evaluation of new plant species. All such introductions present an inevitable pest risk and such efforts, although necessary, emphasize the need for good and accurate intelligence, a rare commodity that is of great value to any responsible plant protection agency that hopes to survive in the future.

The Canadian Plant Protection Division presently operates or has under development some nine different information systems that are designed to service the import, export, control systems and also to provide required biological support to the regulatory programs. Efforts are also being made within the North American Plant Protection Organization (NAPPO) to develop information linkages within the member countries and to promote and participate with the Food and Agriculture Organization (FAO), United States Department of Agriculture (USDA) and Commonwealth Agricultural Bureau International (CABI) in the development of larger databases that could serve as a valuable source for much needed plant pest information.

In Canada the importation of plant commodities is monitored through an automated permit system that allows the adjudication of some 15,000 annual demands and the issuance of some 11,000 permits a year. Inspections are performed on approximately 20,000 import consignments through document verification, visual examinations, sampling schemes, laboratory analysis and a diagnostic and post-entry quarantine security, testing and indexing system.

A new import control system is now under development. This will involve a comprehensive automated retrieval and recording system which will greatly enhance access by inspectors to regulatory information and the reporting of inspection findings.

An EDP system for recording and managing the air passenger baggage control has been in place since the early seventies. This system generates profiles of this type of traffic that permit the application of limited resources to the areas representing the greatest pest risk.

An import/export certification system was implemented in 1988. This included all of the Canadian import regulations and the import regulations of countries with whom we trade. All of this data can be accessed by our field offices within the seven administrative regions of the Agricultural Inspection Directorate.

The Food Production and Inspection Branch operates a post-entry quarantine (PEQ) station at Sidney, B.C. for testing and indexing of fruit tree and grape stock accessions that are imported under permit from approved certification schemes or for

new crop development purposes. All of the data needed to track the thousands of individual clones, varieties, and replicated plants in field plots, in the screenhouses and in the disease-free repository plots, is entered, stored and manipulated through a PEQ automated data processing system at this station.

The Seed Potato Bureau has implemented a new seed potato information system for recording all inspections of certified seed fields in the potato growing areas of Canada. It enables the regions and the program people at headquarters to trace any seed lot back to its origin and to the users of such seed in the event that a significant plant disease is found during field inspections. It permits the user to generate some 1000 different reports. It also includes the tuber unit-test results of the test plots in Florida.

The Diagnostic (Biological) Services section has one database now in operation that includes approximately 2,500 insect, mite and mollusk pests. The system provides immediate access to host-origin-pathway data to service new demands for biological assessments generated by the other regulatory sections of the division. These organisms are mostly pests of fruit, nut, vegetable, legume and oilseed crops plus some pests of forests and stored products. Another database is now under development to accommodate data for diseases of fruit trees, grapes, legumes, cereals, potatoes, vegetables and forestry and oil seed crops. This data is currently stored on some 2,500 individual card files. This data is organized by scientific name, synonym, world distribution, hosts, economic importance, and quarantine status if known.

The results of import inspection sampling, laboratory analysis, testing and indexing of nursery stock, seed, grape stock, fruit tree stock, potatoes, and used agricultural equipment generates a great deal of data that is presently documented, sorted, organized and recorded for the annual report of pest interceptions. An effort is currently underway to develop an automated processing system that would collect, sort, organize and publish this data in the year of collection. This system will provide the ability to generate profiles for the pest pathways by origin, host, and destination. This will readily provide the facts required to efficiently manage the plant health import program and supplement the information needed to negotiate changes in the phytosanitary requirements of other countries by our Export section.

On the international scene, Canada is participating in several initiatives, promoting others and exploring all known systems that would assist in the collection, verification, manipulation and communication of plant pest information.

Within NAPPO an effort is underway to build and harmonize

the plant quarantine information retrieval (PQIR) systems of the member countries, and to test the efficiency of linking these three systems for import/export control and other common purposes.

Canada and the United States, FAO and other countries are interested in developing a pest risk analysis system and are exploring ways of accessing the database of CABI in London, England. A workshop of interested and knowledgeable specialists of several countries has been scheduled for April of 1989 to determine how to redesign this system to make it applicable to the needs of pest risk analysis. A paper covering the subjects of pest incidence, crop damage, quarantine control measures, pest ecology and bioclimatology will be prepared by Canada for presentation at this April workshop.

FAO is now interested in developing a quarantine database that would include all of the PQIR information of their 92 member countries that could be organized under one common format. The intent would be to make the system accessible to all member organizations of the International Plant Protection Commission (IPPC).

The National Agricultural Pest Information System (NAPIS) of USA is now well known to all of you here and this is another valuable source of data that could complement a world phytosanitary intelligence system.

The USDA-ARS is currently interested in computerizing all of the pathology publications and there is a data base under development at Fort Detrick, Maryland by Dr. Matt Royer to cover pathogens of world wide distribution. Information is being solicited from all countries. Some 600,000 index cards with pathogen-host records are presently being sorted. Outside of the centers in Britain and USA there are several herbaria of international fame that would be valuable contributors to an international data base. These are:

1. The Rijk's Herbarium, Delft, Netherlands

2. The Danish Seed Laboratory, Copenhagen, Denmark

3. The biological collection at the University of Uppsala, Sweden

4. The Ann Arbor Arboretum, Michigan, USA

On Thursday of last week colleagues and myself had an opportunity to visit an Ottawa office of TYDAC Technologies. Tydac has developed software packages for an Agriculture Canada research scientist working on grasshopper forecasting. The software is able to mix and match, collate, calculate and display

all of the data that would be needed by anyone seeking answers to grasshopper outbreaks, population growth, survival, crop damage and thresholds for pest control applications. The capability of this one model seemed endless as we witnessed electronic displays, soil types, precipitation patterns, temperature fluctuations, grasshopper incidence over time, multimap overlays, resulting crop damage co-efficient, correlations of pest incidence, treatment applications and control efficiencies and were given hard copy colour prints of these same displays to examine. It was further demonstrated that the often wished for technology is indeed available and accessible to plant protection agencies now endeavouring to develop and operate pest risk analysis systems.

What is now needed is access to accurate data for the ecological variables that govern the existence of specific pest populations in other countries and it should be relatively easy to then correlate this information with the bioclimatology and other data that appears to exist in abundance within Canada and the United States. Tydac has conducted some work in the Caribbean for several governments but I am not aware of all of the details. I have brought along several governments packages, specially prepared for this workshop by Tydac and those of you who are computer experts may wish to study this literature and make whatever future contacts with Tydac that would be appropriate for your purposes. I wish to emphasis that I am not on commission or would benefit in any way through the distribution or promotion of Tydac Incorporated or their products.

THE NATIONAL ANIMAL HEALTH MONITORING SYSTEM (NAHMS): THE EVOLUTION OF A NATIONAL SURVEILLANCE PROGRAM

by

Farrar, J.A., Hueston, W.D., Miller, L.
National Animal Health Monitoring System
USDA-APHIS-VS

I will share with you today, five major topics relating to the NAHMS program. These are: (1) how and why the NAHMS program began; (2) some results of this initial effort; (3) the current status of the program; (4) future direction of NAHMS; and (5) suggestions for developing national surveillance systems.

The need for timely, statistically valid information concerning prevalence, incidence, and costs of animal health, diseases and impaired productivity are well recognized and documented. This is one of the reasons you are here today. The concept of a national surveillance system is not a new idea. Beginning in 1920, The United States Livestock Sanitary Association called for a method to collect, analyze, and distribute information relating to the health of livestock. Numerous other committees and institutions, including the National Academy of Science, have documented the need for such a system.

Past attempts to create a national surveillance system in the United States have been unsuccessful. Some systems collected slaughter data and information concerning diseases of regulatory interest such as brucellosis and tuberculosis. Others attempted questionnaires and mail-in reports from practitioners. Each of these systems were eventually discontinued due to lack of reasonably accurate denominator (population at risk) data and under-reporting.

The NAHMS program began in 1983 as a pilot project in the States of Ohio and Tennessee. Soon five additional States were added. These seven pilot States were allowed great flexibility in developing methodologies for conducting comprehensive surveillance programs. During the next four to five years, this approach allowed each State to experiment with differing methodologies, and as expected, produced many successes and numerous opportunities to learn from our mistakes.

Now, to give you some results from the initial pilot project. In California surveying 43 dairy herds, costs associated with clinical mastitis for a one year period totalled $452,710. Assuming that the randomly sampled herds are representative of the State population, these costs can be extrapolated to total mastitis costs for all herds in the State of $28,000,000 per year. Two years of swine data from Iowa suggests that less than 15 percent of all health related events on hog farms were confirmed by a veterinarian or diagnostic laboratory. In one year of data from Tennessee beef herds, expenditures for the services of a veterinarian accounted for only 16 percent of total disease costs and only 5 percent of prevention costs by producers. However, the individual State estimates cannot be amalgamated into national estimates due to the differing sampling and data collection methodologies.

The NAHMS program is now in transition from a series of seven individual pilot projects to a standardized national program. We are adopting the optimum methodologies identified in the pilot States and developing consistent guidelines which will provide data for national estimates. For such a large scale program to succeed, cooperation between State and Federal animal health officials, agribusiness, and universities must be maintained.

The basic cycle of NAHMS begins with planning and training. Individuals called NAHMS Coordinators are assigned to each NAHMS State. These individuals are responsible for coordination of the planning and training within the State including supervising data collection and data entry, assuring data quality, and providing feedback to producers. A random sample of producers is selected with the assistance of the National Agriculture Statistics Service. This USDA Agency employs over 300 statisticians and maintains up to date lists of producers. After obtaining informed consent, USDA-APHIS-VS field veterinary medical officers (VMO) visit the producer, explain the program, and begin data collection.

VMO's ask the producer to keep detailed records of herd inventories, animal health events, disease costs, and prevention costs. Producers are not asked to diagnose disease but merely to describe signs of disease. Periodically, the VMO's visit the producer to review the information, record the data on standardized forms and submit the data to the local NAHMS Coordinator. The NAHMS Coordinator reviews the data for errors and supervises the data entry on microcomputers and software provided by the NAHMS staff. At the end of the data collection period, individual producer reports are generated and returned to the producer by the VMO. The raw data are then delivered to the NAHMS staff for aggregation with other States and subsequent generation of national estimates.

A more intensive sampling of selected herds, called subsampling, will provide additional information. Collection of faeces, blood, feed, and water samples will provide validation of producer observations of signs of disease. Other potential benefits of subsampling include estimation of normal values, detection of subclinical disease, development of serum banks, and further characterization of management and environmental factors.

The goal of the NAHMS program is to provide recommendations for improving animal health and production efficiency by generating descriptive statistics of animal health and economics, analytical studies addressing specific health issues, and modelling of options of disease prevention and control. The validity of the NAHMS descriptive statistics stems from a statistically - based, representative sampling design.

The population base for the NAHMS national sample will include at least 70 percent of the total animals and 70 percent of the herds in the United States. The program will strive to report descriptive statistics with a coefficient of variation of less than 20 percent. Coefficient of variation reflects the reliability of the information, and the long term usefulness of NAHMS depends on generating reliable information. NAHMS supports analytical studies of the interactions between agent, host, environmental, and managerial factors in determining herd production efficiency and health. The collection of biological specimens is a part of these analytical studies. The goal of NAHMS is to identify those risk factors which are associated with at least a doubling of risk for the herd. The descriptive and analytical information are combined for the building of models to predict the impact of specific disease intervention strategies or to test specific hypotheses. Model building must ensure robustness, the ability of the model to demonstrate the impact of small changes in individual model variables.

To reach these goals, a strategic plan for NAHMS has been outlined. The pilot projects in the seven original NAHMS States will be completed in the 1989 fiscal year. No more State pilot projects will be funded. The national implementation of NAHMS will begin with a narrow focus based on the lessons learned from the pilot projects and the recommendations of advisory groups and consultants. The production systems of each class of livestock will be compartmentalized to assist in narrowing the focus. For example, the national survey of the swine industry has been compartmentalized into four areas; breeding, farrowing, weaning, and finishing.

National results will emphasize descriptive statistics first, then add on by analytical studies and modelling. The NAHMS implementation begins with methods development, followed by field testing of the forms and procedures on an individual State level (alpha test) and national level (beta test). Measurable

goals and a specific timetable will enhance the credibility of the program. Throughout development, NAHMS will utilize available scientific expertise from other government agencies, industry and producer groups, and universities. The program's success is dependent on quality and service.

For the 1989 fiscal year (October 1, 1988 to September 30, 1989), NAHMS will focus on swine health. The seven pilot States (CA, CO, GA, IA, MI, OH, TN), and the six new NAHMS States (AL, IL, MD, OR, VA, WI), comprise 42 percent of the swine operations and 51 percent of the swine in the United States. The swine industry has been one of the leading proponents of NAHMS and has recently pressed for mandatory individual animal identification, a move which may benefit NAHMS in the future.

Assessing the present coverage of other classes of livestock and the methods development work completed in the pilot projects, the next class of livestock to be surveyed nationally by NAHMS is dairy, followed by poultry. In fiscal year 1989, the NAHMS swine forms and procedures will be field tested in at least eight States: AL, GA, IL, MD, OR, TN, VA, and WI. The focus will be describing death and illness among sows and baby pigs in the farrowing and nursery periods. The national test of a coordinated survey will take place in fiscal year 1990, involving all 13 of the current NAHMS States with simultaneous implementation of a survey of swine. Development and field testing of the dairy forms and procedures will follow in 1990.

We have learned many valuable lessons from our experience with NAHMS. I will share some of these with you today. First, specifically define and document the short and long term needs and objectives for a surveillance system. The old adage of "If you don't know where you are going, you will never know how to get there" certainly applies.

Second, plan and conduct a focused pilot project to "try your wings". There is a danger in all large projects of planning and talking a program into extinction. There is no perfect design that everyone will agree upon. Assess your resources and objectives, utilize existing expertise, plan effectively, then do it!

Third, provide useful and timely results to all participants. Feedback of information is perhaps the most crucial element in surveillance systems. Frequently, people can be convinced to participate for the short term, but will not continue long term without seeing positive economic/societal benefit from the results.

In summary, the national implementation of NAHMS provides a source of reliable animal health information for use in improving production efficiency and the quality of animal - derived foods. Accomplishment of the goals of NAHMS requires a sound scientific basis, emphasis on useful results, and an ongoing commitment to the ultimate beneficiaries, American producers and consumers.

APHIN - ANIMAL PRODUCTIVITY AND HEALTH INFORMATION NETWORK

by

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The adoption of a health management approach to the delivery of veterinary services to livestock industries is dependent on information concerning the health and productivity of the herds being available. The requirement of storing and summarizing data generated and recorded on individual farms has been met to a large part by the use of microcomputer based herd health programs operating on the farm or in veterinary clinics (Harman et al., 1984, Oetzel and Mortimer, 1985). One limitation to this approach is that these programs lack the ability to compile and analyse data from various sources or geographic regions.

In addition to records kept by individual producers, there are many sources of health and productivity data which are likely to be useful to producers and veterinarians adopting a health management approach to livestock management. However, data from these various potential sources are frequently not readily available, or, if available, are not in a form that permits their collation with data from other contributors. The Animal Productivity and Health Information Network (APHIN) is being established at the Atlantic Veterinary College (A.V.C.) to resolve the limitations described above. It will increase the availability of data on health and productivity in the swine, dairy and beef industries and will coordinate its delivery to producers, veterinarians, extension workers and others involved in livestock production.

GENERAL STRUCTURE

APHIN consists of a number of microcomputers residing on farms, in veterinary practices, in an abattoir, and in Prince Edward Island (PEI) Department of Agriculture laboratories and offices. These microcomputers all contribute data to a central database. In general, these microcomputers operate completely independently of the central computer and meet most or all of the user's local information processing needs. Relevant data are extracted from files stored in the microcomputers for transmission to the central database. The central database collates, analyses and summarised the data it receives.

HERD HEALTH AND PRODUCTIVITY PROGRAMS

Computer based programs for monitoring health reproductive performance and production of livestock were first developed in the early 1970's (Blood et al. 1978). Since then they have been shown to be of considerable value in improving the production efficiency of livestock operations (Williamson, 1980, Harness et al., 1987) and in supporting epidemiologic research (Bartlett et al., 1986). These programs can be operated on individual farms or a record processing service can be offered by private veterinarians, veterinary colleges or government departments of agriculture. In general, these programs take relatively simple farm records and process them in such a way as to maximise the value of the information which can be derived from them. Output from these computer programs can be broken down into three general areas. Firstly, management aids such as lists of sows due to farrow, or lists of cows to be examined at a herd health visit, are produced. These help insure that important events are not missed. Secondly, production monitoring reports are produced to identify areas of the livestock operation which are not meeting performance targets. Finally, more detailed "diagnostic reports" can be produced to help pinpoint reasons for failure to meet production targets.

In order to successfully integrate data from these programs into an information network, it is imperative that a limited number of programs be used by participants. Wherever possible, APHIN has selected commercially available software (e.g. PigCHAMP c U. of Minnesota) for support and integration into the network. No appropriate software packages were found for the beef industry in P.E.I. so APHIN has developed a set of recording programs for that industry. Details of the programs in use have been published elsewhere (Dohoo, 1988). At the present time approximately 25 dairy herds, 60 swine herds and 35 beef herds are enrolled on APHIN supported programs.

ABATTOIR DATA

In the fall of 1987, installation of an electronic data capture system on the hog kill line at the only federally inspected abattoir in P.E.I. commenced. This abattoir slaughters approximately 90% of the hogs produced on the island. The system underwent testing and commenced operation in June 1988. Technological features incorporated into this data capture system include the use of transponders (small electronic devices which emit a unique identification number) on carcass hooks and viscera pans for the unique identification of each carcass and viscera in the plant. A voice recognition system has been incorporated for the capture of data from the viscera inspection stations. This enables federal inspectors to have both hands free to carrry out

their inspection and, at the same time, record data for all viscera examined.

Data which will be captured by the system include the following:

1. all carcass quality data including weight, yield and index;

2. viscera lesion data including severity of pneumonia, ascarid induced liver lesions and other problems seen at the viscera inspection stations; and

3. all demerit and condemnation data recorded by veterinary inspectors.

All data are identified as to farm of origin by the slap tattoo placed on the animal prior to slaughter. Monthly reports summarizing the health status of pigs shipped will be prepared for distribution to interested producers.

Work is currently underway on the incorporation of other data sources into the information network. These include: the P.E.I. Department of Agriculture Milk Quality Laboratory; the Dairy Herd Analysis Service (MacDonald College, McGill University); and the Provincial Veterinary Diagnostic Laboratory (operated by the Department of Pathology and Microbiology, A.V.C.).

Future plans call for the integration of the following data sources into the network:

1. beef kill line at the federally inspected abattoir;

2. provincially inspected abattoirs;

3. provincial Animal Health Services (which includes a record of all diagnoses made by veterinarians on visits to livestock farms);

4. A.V.C, teaching hospital; and

5. provincial nutrition laboratory.

CENTRAL DATABASE

The central database serves two major functions. The first is the incorporation of all data into a common computer environment so that they can be collated based on farm and animal identification. This will allow for the amalgamation of data from several sources into a summary report for a specific farm. For example, a report on respiratory disease for a swine producer

may contain data from the viscera inspection process at the abattoir, records of clinical disease from herd health programs and specific diagnostic data from the diagnostic pathology laboratory. The second function is the regular analysis and summarization of incoming data. The central database will be able to carry out analyses not performed by the local microcomputer systems and to present data in different forms. For example, milk weights for all cows in a herd can be converted into a herd lactation curve. Average values for all participating herds will also be computed so that producers will be able to compare their results to those of other participants.

Information generated by the central database will be made available in three forms. Firstly, summarized data for various time periods will be stored in the form of tables in the central database. Users with computer terminals will be able to access these tables. Secondly, some reports (e.g. summaries of data from the abattoir) will be produced and distributed regularly. Finally, programs for the investigation of specific problems (such as the swine respiratory disease summary mentioned above) will be prepared for use when required for specific herds.

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III. SYSTEMS FOR THE CARIBBEAN

Chairman: Dr. Franz Alexander

FEASIBILITY REPORT ON ANIMAL HEALTH INFORMATION AND DATA MONITORING SYSTEMS FOR CARICOM MEMBER STATES AND SURINAME

by

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INTRODUCTION

In the 1986 report "Animal Health Plan for the Americas by the Year 2000 PLASA 2000", published by the Inter-American Institute for Cooperation on Agriculture (IICA), priorities for animal health for the Americas were clearly enunciated. Animal health information systems are considered essential for the success of any effort to improve animal health and to increase animal production. This project resulted from mutual agreement between IICA and the CARICOM Secretariat.

The primary purpose was to determine the feasibility of developing National Animal Health Data Monitoring Systems (NAHDMS) in the English-speaking Caribbean countries. The feasibility study was the initial phase of a multi-phase effort by IICA to address the issue of implementation of NAHDMS. The general strategy was approved by the Ministers of Agriculture through CARICOM with IICA acting as the technical advisor.

A multi-disciplinary team of veterinary epidemiologists and clinicians (total of 13 individuals) from the College of Veterinary Medicine at North Carolina State University cooperated to complete the 5 month feasibility study. A major purpose of the initial study was to assess the current status and capabilities of present animal health delivery systems, i.e., equipment, facilities, training programs, diagnostic laboratories, and to assess future animal production goals and economic systems for animal industries in the individual countries and region. In general, a team of 2 veterinarians visited each country during the fact-finding mission. Prior to and during each visit, input was solicited from Ministers of Agriculture, government and private veterinarians, agricultural extension personnel, distributors of animal health products and feeds, producers, livestock owners, diagnostic laboratory personnel, animal health technicians, governmental agricultural

consultants and other parties in each country. Information was gathered about the number and type of livestock, governmental policies and concerns, management practices, sources and costs of livestock feeds, animal health infrastructures, value and markets for products, attitudes, needs, desires and other relevant factors. The intent was to attempt to understand the animal industry in each country and all factors impacting upon the industry, especially as related to NAHDMS.

Specific objectives were to:

1. Evaluate present animal disease records and reporting systems

2. Evaluate present capabilities for diagnosis, treatment, and control of disease.

3. Determine the need for additional veterinary and animal health support services

4. Recommend strategies for NAHDMS for individual countries and the region as a whole

5. Estimate the cost of developing and establishing NAHDMS

6. Recommend mechanisms to integrate national and regional Animal Health Monitoring Systems

7. Utilize study findings to develop sample examples of Animal Health Data Monitoring Systems to serve as a starting point for implementation

8. Estimate the impact that an integrated Animal Health Data Monitoring System would have upon the economies of the English-speaking countries

Each team was provided with considerable information about animal industries in the respective countries by IICA contacts. This information plus that gathered during the fact-finding mission was summarized by each team upon return. A written report was provided to Dr. Corbett, and then, through meetings with all cooperating individuals, appropriate conclusions and recommendations were made. These in turn were communicated in written form to the grantors by Dr. Corbett.

JUSTIFICATION

Historically, IICA has assisted in the control of animal diseases in the Caribbean and has been an advocate of NAHDMS. Concurrently, the need for the implementation of NAHDMS was supported by economists and government officials of the various

countries. Objective information compiled through NAHDMS appeared necessary for adequate decision making in selecting priority and cost-efficient agricultural industry programs. In the economic growth of the area, it is important to formulate policies directed towards self-sufficiency. Free trade should be promoted within the region and specific countries should be encouraged to produce goods for which they are best suited and thus limit importation. CARICOM is a customs trade union of Caribbean area countries that has resulted from these economic policies. In order to solve the economic problems facing the region, sufficient objective data for decision-making is required and the implementation of NAHDMS is a first and necessary step in addressing the issue. Such efforts are supported by IICA's Animal Health Program. With the recent increased regional emphasis or re-emphasis on agriculture, and specifically animal agriculture, there has been an increased consumption of meat, milk, eggs, poultry and other livestock products. This has resulted in increased importation of animal feeds, leading to an imbalance of trade in these products. In order to deal with this problem, efforts have focused on animal production factors such as management as the basic strategy to increase food production. However, it is also likely that animal diseases and pests presently accepted as endemic are major factors decreasing production in the area. Emphasis has focused on increasing agricultural output and decisions related to animal production have been based upon subjective information. In the present state of affairs, the data is often present but is not collated or available in a usable form. It is strongly advocated that decision-making in this area should be based upon objective data, which points to the necessity for NAHDMS as a source of such data.

A further development from implementation of NAHDMS would be facilitation of cost-benefit analysis, allowing regional policy decisions to be made based upon comparison of potential project outcomes and the associated costs for alternative protocol(s). NAHDMS can be used to promote control and prevention programs as well as providing a framework for the early identification and warning against exotic animal diseases.

It is envisioned that data collected from NAHDMS (incidence rates, prevalence rates, etc.) would be available and used on a country by country as well as on a regional basis. Regional, centralized information would require that consistent, dependable, and reliable data are obtained from each member country. Such information as the number of animals by species, animal disease incidence, production parameters, prevention protocols, management practices, facilities, and economic factors could be rapidly disseminated and used by member countries in such a system. In order for the system to be accepted, confidentiality must be assured to the users and farmers must be assured that the information will not be used politically.

Producers and users of NAHDMS must be assured that the system will be to their advantage.

To be accepted and widely used, NAHDMS data must benefit and be readily available to a wide range of users, including farmers, private and government veterinarians, diagnosticians and diagnostic laboratories, government officials, business interests and others. Currently collected information for government disease reports and similar information could be integrated into the NAHDMS and is seen as a mechanism to simplify the reporting, collation, summary and analysis of such information. Disease reporting and accession information currently collected and reported by diagnostic laboratories could also be fully integrated with NAHDMS. This could actually facilitate such data collection by diagnostic laboratories.

BENEFITS OF NAHDMS:

Some of the many benefits of NAHDMS can be summarized as follows and include those items which surfaced as critical needs of the region:

1. Estimate of impact of zoonoses and assessment of public health needs

2. Integration of animal disease and production data

3. Identification of problem areas in terms of disease, management and production

4. Insight into risk factors for critical diseases

5. Cost-benefit analysis of potential intervention programs

6. Information to justify and initiate control and prevention programs

7. Identification and early warning for exotic animal diseases

8. Data for objective decision-making for the agricultural sector

9. Centralized, uniform regional information

In conclusion, the following are considered important components of any NAHDMS format:

1. Indices of diseases by species

2. Indices of occurrence of zoonotic diseases

3. Warning systems for exotic animal diseases

4. Random sampling (list frame) of selective populations for more detailed analysis

5. Analysis and prediction of disease patterns based upon computer evaluation for specific temporal, geographic and seasonal factors

6. Disease risk factor analysis

7. Cost-benefit analysis of potential intervention programs

8. Monthly and annual summary reports related to monitoring, diagnostic findings and outbreaks

Appropriate examples of several different types of monitors all or many of which would be potentially useful for some of these purposes are given in the report "Feasibility Report on Animal Health Information and Data Monitoring Systems for CARICOM Member States and Suriname" by Corbett et al. Each offers unique advantages and, perhaps, disadvantages. These examples will be discussed during the conduct of this conference.

FINDINGS AND RECOMMENDATIONS

a. Regionalization of NAHDMS:

As indicated in the feasibility study, it is recommended that the concept of NAHDMS be adopted on a regional basis for the member countries. Further, it is recommended that a strategy be developed wherein each country agrees to adopt and participate in a regional system which deals with a minimum database of information important to animal industries in all countries. There is considerable information which is currently gathered in reports each country supplies to various governmental agencies and the adoption of a universal system to collect, analyze, interpret and report this data has many benefits. The benefits of this approach are multiple and include information sharing, mutual support, comparisons among countries, extended usefulness, and the benefits of the commitment of all member countries. Additional benefits include avoiding duplication of development effort, joint training efforts, multiple and efficient use of information and increased opportunities to obtain funds to support such activities. As an important aspect of this endeavour, various agencies such as IICA, PAHO and others should coordinate their efforts to efficiently use available resources.

b. Individualization of NAHDMS:

Equal in importance is the recommendation that provisions be

made to encourage each country to expand and extend the basic system to meet each country's unique needs and desires. This option, while not impeding the regional goals, should allow each country to customize it's use of such a system. This offers clear advantage in terms of full utilization of each country's availability of expertise and other resources.

c. **Centres of Excellence:**

It is recommended that implementation of NAHDMS and expansion of diagnostic capabilities be done in such a way as to allow each country to develop one or more areas of expertise. These Centers of Excellence would help ensure efficient integration and cooperation at the regional level, as well as promote regional and national pride, which are desirable ingredients for long-term success. Each country operating independently does not have the resources necessary to provide the full complement of services and resources which would contribute maximally to development of animal industries within the countries. Each country should contribute to the benefit of the entire region by sharing its expertise and resources.

IMPLEMENTATION

The value of animal health information systems seems to be widely accepted. From a very practical standpoint, implementation is the critical focal point at this time. Because of the various needs of the individual countries, such a system should be directed at a basic level, with flexibility for expansion by each individual country. Success in this endeavour will be assured if the commitment of those participating is gained. This commitment will be forthcoming if the participants are convinced that implementation of NAHDMS will be in their best interests. Considerable effort must be directed at identifying what those needs are and to assure that all participants are convinced they are critical. After identifying what it is that the animal health information system can do for participants, the next step is actual implementation. IICA should provide support and input at this step to ensure appropriate integration. In order to be successful, the system has to be used and provide reliable and useful information. There are numerous examples where computers and complicated systems have been instituted, with little follow-through and little actual benefit. Sustained effort will be a key ingredient to success. Training, retraining and considerable opportunity for problem-solving in dealing with the system must be readily available. This would suggest that a local site for training and problem-solving assistance be available. The actual system set-up and initial training could be based upon outside expertise. However, local training and

actual use should eventually be based upon local expertise. National governments cannot overlook the need for personal incentives if present staff are to undertake these new tasks. Additional personnel will probably be required in order to support initiation and maintenance of such a system. Return may not be immediate or highly visible, since this is an investment for the future. Once initiation is achieved, the system should be put into actual use, starting with well-defined and limited goals. This would assure success and would likely lead to additional use of the system. For example, the system could initially be used to computerize reports, collating and summarizing of current disease reporting information provided to IICA or PAHO. Use for such data would be relatively simple and allow all involved to become trained and confident in actual use of the system. As a next step, the system could be used to collect information on animal numbers by species or targeted producer populations as a demonstration device to gain user confidence. Integration of such efforts with extension outreach or other disease control efforts could greatly facilitate adoption of the system. If success is achieved in early endeavours, further use and development should follow.

CONCLUSIONS

The animal industries of any nation are a critical and valuable asset, providing sources of economic benefit and food for its peoples. Development and maintenance of animal industries requires considerable knowledge of the nature of those industries. Objective data is necessary to assess the current level of health, productivity and disease in such animal populations. A uniform, reliable and useable system to obtain data on those populations provides a means of identifying their importance and value and to guide efforts to maintain the health and reduce disease in such populations. An infrastructure based upon people, paper and machines committed to collect reports, collate, analyze and use such information would directly facilitate development of animal industry and provide objective data for decision-making. Government and private individuals in each country must ambitiously embark upon this critical mission.

PLANT PROTECTION INFORMATION STUDIES IN THE CARIBBEAN

by

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INTRODUCTION

There has been a long history of plant protection studies in the Caribbean region. Two recent bibliographies, for example, indicate that papers in plant pathology were being published in the English-speaking Caribbean since 1880 (Brathwaite et al. 1981) and similarly in entomology over 100 years ago (Pollard, in prep.)

From some of the earliest reports certain species have always been considered major pests and even today are still regarded as having major pest status. Witches' Broom and Black Pod in cacao or Moko disease of bananas have been recognized as major diseases since the earliest part of this century; similarly froghopper in sugar cane and leaf-cutting ants have long been considered major insect pests. In the past decade pest organisms like coffee berry borer, coffee leaf rust, sugar cane rust and smut have all contributed to serious loss in the region. Not all of these pests, however, are distributed throughout the region. With the increase in, and the freeing up of trade in agricultural products within the region, there are the attendant risks of the spread of pest species more readily throughout the Caribbean. Already, the various plant quarantine systems are hard pressed to keep exotic pests out of the region. At times in the past natural agents have allowed various pest species to bypass all quarantine barriers. The entry of sugar cane rust and smut and sugar cane thrips has occurred through the agency of strong wind currents bringing these pests across the Atlantic from Africa. More recently, we have seen similar currents bringing the desert locust to the Caribbean.

In order to be constantly one jump ahead of the many pest problems facing Caribbean agriculture there must be a steady generation and flow of information, both to the farmer and to the planners of national policy. Through the extension service the farmer must be kept informed to allow him to maximise his

production and, in this context, through improved plant health. The national planner must have readily available information to allow him to decide in an unbiased and reasoned fashion, for example, on the likely pest risk of allowing some plant or plant product into the country.

This paper highlights aspects of plant health information studies in the Caribbean in an attempt to show how these studies could allow for improved crop protection and, hence, improved production. An attempt willalso be made to highlight, using suitable examples, how the lack of important information hinders better decision-making in plant health.

PLANT QUARANTINE

Given the uncertainty of markets for the traditional crops like sugar cane, bananas and cocoa, in addition to their high production costs in many islands, crop diversification programmes will intensify in the region and new pest problems will invariably arise. These would likely include the elevation of new species to major pest status as well as the entry of exotic species into the region. The latter situation is especially predictable due to the generally inadequate plant quarantine systems present in a number of islands. The status of plant quarantine in the Caribbean has been recently analyzed and a number of short-comings recognized (Pollard, 1986). What is ironic about plant quarantine in the region, as this author pointed out, is the fact that plant quarantine regulations were in existence in the region over 100 years ago, long before such legislation existed in many other more developed countries. The introduction of various pest species into the region over the past few years (Table 1) underscores the inadequacy of plant quarantine systems in the Caribbean.

ECONOMIC IMPACT STUDIES

To counteract the many pest problems occurring in the region an almost total reliance has been placed on the use of chemical pesticides for pest control. While total pesticide use figures are not easily available, one study has indicated a fairly high use pattern. In Trinidad, for example, there was a pesticide load of 145.2kg/km^2 of land area and 0.62kg/capita of population per year (Pollard, 1980). This compares, for example, with similar data for Central America (Guatemala, El Salvador, Honduras and Nicaragua) of 75kg/km^2 and 2.0kg/capita (ICAITI, 1977).

Despite such high pesticide usage, one may question the rational basis for such use in many instances. There are very few studies, for example, to determine economic threshold levels

for a particular pest species. Pesticides are therefore applied most frequently in what has been referred to as scheduled Table 1

Table 1. Some recent introductions of pest organisms into the Caribbean region and neighbouring areas (modified Pollard, 1986)

Pest/diseases	Crop attacked	Pest Introduction Location	Year Reported	Present distribution
Plutella xylostella (diamond-back moth)	Crucifers	Trinidad	1945	Widely distributed
Acromyrmex octospinosus (Leaf-cutting ant)	Many crops	Guadeloupe	1954	Carriacou, Cuba, Curacao, Guadeloupe, Trinidad & Tobago
Eriophyes guerreronis (coconut mite)	Coconut	Mexico	1960	Bahamas, Brazil, Colombia, Cuba, Guyana, Haiti, Mexico Nicaragua, St. Lucia, Trinidad & Tobago, Venezuela
Mycoplasma-like organism (lethal yellowing)	Coconut	Jamaica	1961	Bahamas, Cayman Islands, Cuba, Dominican Republic, Haiti, Jamaica, United States (Florida)
Diatraea centrella (small moth borer)	Sugar cane	Bahamas	1965	Bahamas, Grenada, Guyana, Martinique, St. Lucia, St. Vincent, Suriname, Trinidad & Tobago, Venezuela
Ustilago scitaminea (smut)	Sugar cane	Guyana	1974	Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Nicaragua, Panama, Puerto Rico, St. Christopher and Nevis, Trinidad & Tobago, United States (Florida & Louisiana), Venezuela
Phytomonas sp. (cedros wilt)	Coconut	Trinidad	1976	Guyana, St. Vincent, Suriname, Trinidad & Tobago, Venezuela
Hypothenemus hampei (coffee berry borer)	Coffee	Jamaica	1978	Jamaica
Pseudomonas solanacearum (moko disease)	Bananas	Grenada	1978	Grenada, Guyana, Trinidad & Tobago
Puccinia melanocephala (rust)	Sugar cane	Dominican Republic	1978	Barbados, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad & Tobago, United States (Florida, Louisiana, Texas), Venezuela
Apis mellifera adansonii (Africanized bee)	Italian honey bee	Trinidad	1979	Trinidad & Tobago, South & Central America
Fulmekiola serrata (sugar cane thrips)	Sugar cane	Guadeloupe/ Barbados	1980	Antigua, Barbados, Dominica, Guyana, St. Christopher and Nevis, St. Vincent, Trinidad & Tobago

Sternochetus mangiferae (mango seed weevil)	Mango	St. Lucia	1984	Barbados, Dominica, French Guiana, Guadeloupe, Martinique, St. Lucia
Hemileia vastatrix (coffee leaf rust)	Coffee	Belize; Cuba	1985	Belize, Cuba, Dominican Republic, Haiti, Jamaica
Dacus dorsalis sp. complex (Oriental Fruit Fly)	Many hosts	Suriname	1985	Suriname

prophylactic treatments (Mumford, 1981) or more commonly as calendar spraying (Fenemore and Norton, 1985). In other words, pesticides are applied as a form of insurance, whether a pest species is at damaging population levels or not. In one study among vegetable farmers in Aranguez in north Trinidad, Evans (1982) pointed out that 97 percent of the farmers studied were doing calendar spraying. However, perhaps one should not blame the farmer too severely since, very often, what little information he had on a spray regime for any crop may have been obtained from the wrong sources. In some instances, too, while pest damage to the plant may appear quite striking, in fact, there may be no real economic loss to the crop. Jones (1985) reported that despite a complex of pests (including various fruit worms, mites and fruit-piercing bugs) attacking tomato in the Piarco area in Trinidad, only a six percent direct fruit loss resulted. One may therefore wish to question whether such a loss would warrant the high pesticide usage in tomato in Trinidad. There are no data available to answer this question. This same author also reported that under green-house conditions a 50.0 percent defoliation did not result in any significant yield lost in tomato. Similar results have been quoted for Mangold fly (Pegomya sp.) attack on sugarbeet (Hill, 1983).

Not only are data on economic threshold levels important to the farmer or pest control officer on some large farm enterprise, but similar data on economic impact of various pest organisms in general are important for those who have to make decisions in the larger context of national agriculture policy. For example, one study (Pollard, 1983a) indicated that five years after Moko disease of bananas was reported in Grenada, the economic impact of that pest was over US$2.0 million (EC$5.6million). More important is the likelihood that the disease is now to be considered endemic in that country. In hindsight, if the devastating capability of this disease was fully appreciated at the time, a much more serious and vigorous eradication programme may have been mounted. For example, there was a seven-month lag between the Director General, FAO/UN, signing a Technical Cooperation Project in December 1979 with the Government of Grenada and the actual initiation of the project in July 1980. Between the end of this project in July 1981 and the commencement of an EDF-funded project in November 1982, a 15-month period elapsed in which practically no eradication was attempted except for a token effort by the Grenada Banana Cooperative Society (Pollard, 1983a). While admittedly the Grenada Government may have been constrained by various factors including a lack of funds, one may argue that had they all the necessary information available at the time which emphasized the potential of this disease to significantly affect banana production in that country, then perhaps a more serious and sustained effort may have been made for Moko eradication to be a top priority assignment. One may even go a step backward and suggest that, given the importance of bananas to the economy of the island,

contributing to 30 percent GDP at the time, and also given the heavy inter-island traffic in agricultural produce between Grenada and Trinidad and Tobago, then Grenada should have had an effective quarantine against possible Moko introduction from Trinidad where the disease is endemic.

PEST RISK STUDIES

One very important area of concern is the pest risk associated with the movement of agricultural produce in the region. There is very little available information on the attendant pest risks which may result from regional trade in plant and plant products. Such information is essential in order to allow for impartial or fair decision-making on plant quarantine issues by those in charge. For example, whether to place an embargo or not on some produce should only be decided on sound biological data. However, while recognising that any plant quarantine decision may be dependent on economic, social and even political factors, biological factors sensu strictu must be the most important. This approach is what is known as pest risk analysis. Kahn (1979) has defined this as "... a thought process whereby the entry status of plants, plant products, cargo, baggage, mail, common carriers, etc., is based on the calculated risk of inadvertently introducing hazardous pests and pathogens of these items as moved by man".

Kahn (1979) has attempted to provide a theoretical framework for a pest risk analysis by identifying a set of variables which may be used to determine whether the risk or potential danger resulting from the entry of any pest organism into a country was high or low. The factors identified ranged from essential biological characteristics of the pest species like life cycle, ecological distribution, the ability to colonize new habitats, etc., to other components such as the availability and effectiveness of treatments should entry of a pest of quarantine significance occur. One interesting component identified was termed the "..availability of technical backstop in the importing country" in order to deal with the entry of any pest species; 'technical backstop' was defined as "...a collective term for a cadre of entomologists and plant pathologists, existence of a pest and pathogen survey, a co-operating public, availability of chemicals and application equipment or effectiveness of biological control, etc.". The relationship of these various components to the pest risk could be graphically expressed. For example, the pest risk is high where the colonizing ability of the introduced pest is high or the pest risk is low where there are adequate numbers of plant quarantine personnel and related facilities (Figure 1).

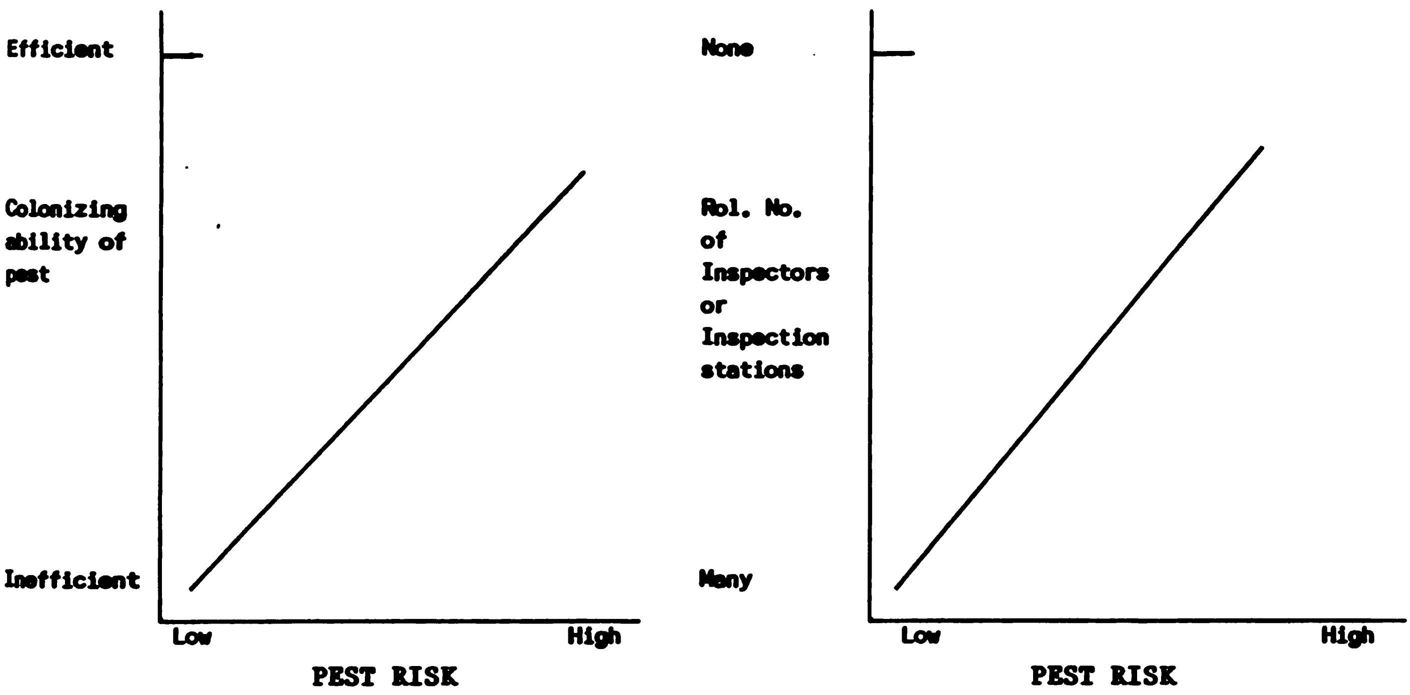

Figure 1: The relationship of pest risk to two of its components (After Kahn 1979)

Therefore the decision to allow or disallow entry of any item into a country could be determined entirely by the availability of a 'technical backstop'. Kahn (1979) suggests that such a decision is likely to be conservative where there is an inadequate 'technical backstop' and, conversely, more liberal where this is adequate.

In this context one finds that plant quarantine decisions in the region tend to be very conservative because of the generally inadequate technical backstop (Brathwaite, 1981; Pollard, 1986). The general response is to place an embargo on any product which is believed to pose a pest risk despite the lack of any supporting evidence. This has been very well exemplified by the case of mango seed weevil and will be discussed below.

One recent study attempted to determine the pest risk associated with the inter-island schooner trade between Grenada and St. Vincent and Trinidad and Tobago. While there appeared to be no major risk to Trinidad and Tobago of pest introductions from Grenada and St. Vincent the same could not be said for movement in the opposite direction. Anastrepha fruit flies, the sweet potato moth borer Megastes grandalis Guen, leaf cutting ants Atta caphalotes L. and Acromyrmex octospinosus Reich and Moko disease of bananas were all considered very serious risks to agricultural production in Grenada and St. Vincent (Pollard, 1983b). Of these pests only the economic impact of Moko disease on banana production was assessed as reported above (Pollard, 1983a). However, the impact of the other pest organisms may be equally devastating. Both Grenada and St. Vincent, for example, are now officially declared fruit fly free by USDA. Introduction of these pests to these islands at this time would have disastrous consequences on their incipient and potential trade links with the United States.

MANGO SEED WEEVIL - A CASE STUDY IN LACK OF INFORMATION

Mango seed weevil (MSW), Sternochetus mangiferae (F.) (Coleoptera: Curculionidae) has long been reported as a pest of mango in the Old World - Africa, Asia, India, Indonesia, Australia and the Pacific Region including Hawaii. In fact, it is found practically everywhere mangoes are grown (Dey and Pande, 1987). More recently MSW has been reported for the Caribbean region. It was first reported in St. Lucia in 1984 and very soon after in that same year in Guadeloupe and Martinique. By 1986, MSW was reported in Barbados, Dominica and French Guiana (Pollard, 1988). One view is that this pest may have been in the region for some time (Brown, 1980), maybe for at least the past 10 years, most likely introduced into the French islands through trade links with the former French colonies in Africa (Woodruff, 1987).

Eggs are laid on young fruit and newly hatched larvae make

their way directly into the seed where they spend the rest of their larval life. They feed on and eventually destroy the cotyledons. This results in a serious loss where seeds are required for propagation purposes (Shukla et al, 1985). MSW also damages the fruit when the adult insect leaves the seed and makes its exit through the skin. This causes both direct damage to the pulp as well as allowing for secondary infestation by various pathogenic organisms leading to tissue breakdown. This latter damage occurs only in late maturing cultivars.

While S. mangiferae is generally regarded as an important economic pest of mango throughout its distribution, some workers have expressed doubt about this. Shukla et al, (1985), for example, quote estimates of damage between 46-93 percent for some parts of India, while seed infestation may be 100 percent in some areas in Hawaii (Balock and Kozuma, 1964). Despite such reported losses, however, other studies suggest that MSW should not be regarded as a pest of serious economic importance. Certainly Balock and Kozuma (1964) were of this view for Hawaii, despite high seed infestation levels; more recently Woodruff (1987) was of the same viewpoint for mango production in some Caribbean islands.

What is certain, however, is that whether the pest is of direct economic importance or not in the field, it is always considered a pest of major quarantine importance (Balock and Kozuma, 1964; Brown, 1980; Pollard, 1986; Dey and Pande, 1987).

Once the incidence of MSW was reported to the Caribbean Plant Protection Commission (CPPC) by those countries infested with this pest, CPPC was obliged to inform all member countries of the presence of MSW in the reporting countries. The first reaction of any mango-importing country was to put an immediate embargo on fruit from the infested country, an example of the "conservative" type decision described by Kahn (1979). Barbados therefore applied an embargo on fruit from St. Lucia and the French West Indian islands; St. Vincent applied a similar ban; Trinidad required mango importers to obtain import permits, but these were not being issued for fruit from infested areas. However, St. Vincent was included in the latter category even though they had never reported the incidence of MSW. Barbados discovered that it was not free of MSW in 1986, yet it has maintained to date the embargo on fruit from St. Lucia. This response to MSW incidence in the Caribbean serves to highlight very clearly how, in the absence of firm data and information, decision-making may appear to be irrational or erratic. A decision to place an embargo on fruit from a non-infested country was made because the importing country was unwilling to accept the reliability of survey data presented by the former country, for example.

In this particular situation it would seem, therefore, that

what was needed was specific information which would have allowed any country to assess the risk which it faced by trading with those countries which had reported MSW incidence. Relevant information would include:

- What are the levels of infestation in the infested country?
- What is the distribution of MSW? Is it limited or widespread in the island?
- Which mango varieties are attacked?
- Are there any varietal differences in susceptibility to MSW attack?
- What kind of protocol was used in surveying for the pest? Is this acceptable or not? Is there a standard survey protocol to be followed by all infested countries?
- Is MSW a pest of economic significance or not? What has been the economic impact of the pest in infested countries?
- Are there effective treatments for infested fruit?

The above questions do not provide an exhaustive list but serve to highlight what kind of information would have to be available for any country to decide on the risk associated with allowing entry of mango from MSW infested areas.

At the heart of the matter is whether MSW is an economic pest or not. The biology of MSW suggests that no direct damage is done to the edible portion of the fruit since early maturing varieties are most commonly grown in the Caribbean. How then does one assess loss due to MSW? At a recent meeting on MSW in Barbados, the delegate from St. Lucia was quite certain that MSW was not an economic pest in his country, while Barbados held just the opposite view. Barbados is currently increasing mango production and has to import seeds for root stock production because of the incidence of MSW. While St. Lucia may not consider MSW to be causing any direct loss, the incidence of this pest has caused them a loss of markets and this is directly measurable in dollars. One may also wish to consider the long-term impact of MSW in St. Lucia. If nothing is done to control MSW because it is not considered a pest one may envisage eventual infestation levels of up to 100 percent as exist in some countries. If in the future a decision is taken to increase mango production would St. Lucia then have to import seed material as Barbados is doing at present? One may therefore once again ask the question whether MSW is to be considered an

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- What kind of protocol was used in surveying for the pest? Is this acceptable or not? Is there a standard survey protocol to be followed by all infested countries?

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economic pest or not? If this were a case of criminal proceedings against MSW, as defence attorney I would have to ask for an acquittal on the basis of lack of evidence, a call for which any prosecutor and judge would have to support. However, that is not to say that the case should be closed against MSW. Much more work on MSW is required to obtain answers for some of the questions posed earlier. And this is the information with which unbiased decisions could then be made on the pest risk attendant on the trade in mango in the Caribbean.

CONCLUSION

In the Caribbean, studies in plant health have been undertaken since the 19th century. Emphasis has focused generally on biological and ecological studies of pest organisms and methods for their control. In the latter case particularly, such studies appear at times to have been conducted on an ad hoc basis. Little information can be found, for example, on assessment of economic impact of pest organisms; studies which should at least parallel, if not precede, those to determine control mechanisms for any pest.

Another area of study which appears to have been neglected is that of pest risk analysis. This becomes extremely important especially where there is a grave risk of pest introductions. Data have been presented above which indicate that the Caribbean has suffered serious pest introductions over the past few decades through increase in both intra-regional and extra-regional trade, movements of people, crop diversification programmes with the attendant need to import planting material, as well as because of its geographic location. Information arising out of pest risk analysis studies is essential to allow the right quarantine decisions to be made. The erratic responses throughout the region to mango seed weevil introduction highlight how a lack of information could lead to biased and what may even appear to be illogical decision making.

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A PROPOSAL TO IMPROVE PLANT PROTECTION AND ANIMAL HEALTH MONITORING FOR THE CARIBBEAN REGION

by

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1. INTRODUCTION

In this paper we consider aspects of the reports on animal and plant health monitoring systems presented earlier today, and then set out a strategic framework on which we propose to build disease and pest monitoring systems that will address top priority national needs.

2. REVIEW OF PREVIOUS STUDIES AND SELECTED DISEASE/PEST MONITORING SYSTEMS

2.1 Feasibility Report on Animal Health Information and Data Monitoring Systems for CARICOM Member States and Suriname

Recommendations of this major report[1] are summarized in Appendices I to III, and by Anderson et al [2].

Our new regional initiative is a response to the report's major recommendation that animal health information systems should be developed in the region. In preparing our approach to this project we have heeded two important messages from this study, paraphrased as follows:

1. Emphasis should be placed on enhancing the region's **capability to conduct epidemiological studies.** This includes the definition of information needs, project design, computer skillsdata analysis, interpretation of results, and most importantly, the communication of conclusions to clients (producers and officials) in a manner which will promote appropriate action.

2. The project should **accommodate the diversity** of national needs by allowing each country to proceed in a individualized manner.

2.2 Other Animal Health Systems and Studies in the Caribbean

There are several projects in place or planned to monitor and/or control specific agents, including:

- Bluetongue[3] - a major project is being conducted in the Caribbean basin by OIRSA, the Universities of Wisconsin, Florida and IICA in cooperation with national authorities and with funds from the USDA

- CAE - a regional survey is underway with testing by the Barbados lab. This project is supported by University of Florida, USDA and IICA[4]

- Swine Fever reports - a hemispheric programme is operated from the IICA Office in Brazil[5]

- Amblyomma projects - several Ministries responsible for Agriculture, USAID and USDA are developing plans for eradication programmes following recommendations of a technical workshop[6]

- National Projects - these will be described in our session tomorrow morning[7]

2.3 Plant Disease/Pest Surveillance and Monitoring Systems in the Caribbean

Proposals to CARICOM and IICA for the strengthening of plant protection services in the Caribbean identify several aspects of the monitoring and surveillance systems that require improvement, including diagnostic capability in the field and laboratory[8,9,10]. Analyses of the economic impact of alternative pest and disease control measures would contribute to improved production and marketing strategies[11]. Pollard[12] has reviewed information studies and requirements in the region and has made some valuable suggestions for work on pest risk and economic impact analysis.

2.4 Selected Animal and Plant Disease/Pest Monitoring Systems in the United States and Canada

Two major information system projects of the USDA, the National Agricultural Pest Information System (NAPIS) and the National Animal Health Monitoring System (NAHMS) are described in the papers by David Talpas[13] and Farrar _et al_[14]. Other USDA animal health information projects were described by Pilchard and Hueston[15]. Reviews of these pioneering systems[16,17,18] provide several lessons that we should heed. Firstly, we must recognize that the costs of comprehensive

disease information systems can strain the resources of even a highly developed country. These reports also emphasize the need for careful definition of the client's information needs. Finally, they suggest that we must take care to ensure that the scope of projects should not be so great as to strain the capacity of the staff and the organization to ensure that the project design and the collection and analysis of the data will withstand scientific scrutiny.

An innovative Animal Productivity and Health Information System (APHIN) has been described by Dohoo[19,20]. We would call attention to two interesting aspects of this system. Firstly, by collecting data for a large proportion of animals on an island, the importance of random sampling can be reduced. Secondly, the system makes effective use of private practitioners rather than public service staff for the collection of information on cattle and swine herds.

Canada's plant disease and pest monitoring systems are described by Gray[21].

3. PROPOSAL FOR DEVELOPMENT OF A REGIONAL MONITORING NETWORK

3.1 A Strategy for the Caribbean Region

The following points were considered in developing our proposed approach to implementation of this project:

- priority to enhancing regional capability for disease monitoring and surveillance
- numerous, diverse, complex and evolving information needs (fourteen countries; plant and animal commodities; changing trade and biological environments)
- costs and difficulties encountered by large information systems in developed countries
- limited resources available
- flexibility afforded by microcomputers
- benefits of networks

We then arrived at a position which coincided with one recently articulated in a Regional Workshop on Information Systems for Small Scale Enterprises in the Caribbean[22]. Firstly, given the wide scope and great complexity of information needs and our limited, albeit high quality, resources, we must be very selective in the questions we

attempt to address. Secondly, as needs change with time, no static system will be adequate. We must therefore place great emphasis on developing a cadre of personnel, in our case epidemiologists, who are skilled in defining information needs, and developing cost effective and practical projects to fill these needs as they arise.

Let us consider the resources available.

a. Resources:

Most important to consider are the resources that the participating countries would be able to provide to their national components of the project. Clearly we will need to work within existing programme budgets, reduced as they may be in some cases. This consideration underlines the importance of placing national priorities first, and of being prepared to tolerate diversity in the "system".

For animal health programmes, this may involve us in projects on slaughterhouse based surveillance, tuberculosis and dairy herd productivity in Barbados, Guyana and Trinidad and Tobago, respectively.

On the plant side, one might consider work on locusts, fruit flies or the problems of quarantine in regional and extra-regional trade, to mention just some of the issues currently high on the agenda of national authorities.

The project approved by the SCMA in May, 1988, forecast allocations over a 4 year period of US$481,000 from IICA's programme budget and US$318,000 from the Canadian International Development Agency. These funds would be available for purchase of consulting services in epidemiology and other disciplines, microcomputers, software, and to support training, networking and management activities of the project, including the operations of a regional office in Trinidad & Tobago. Agriculture Canada will act for CIDA as the Canadian Executing Agency to provide consulting services (from the University of Guelph), microcomputers and training, all of which will be delivered through IICA channels.

b. Proposed Implementation Strategy (recommendations)

The following activities are proposed:

RECOMMENDATION I

Implement a **series of model "mini" projects**, each of

which would address priority questions to be defined by one or more of the participating countries. A maximum of 6 projects is proposed for the first two year period. These projects should be sufficiently diverse to ensure the development of a range of epidemiological skills in the region. They might include:

- survey methods for specific pests - to establish presence or absence, incidence, trends and or distribution (possible pests include fruit flies, mango seed weevil, M. tuberculosis, etc.)

- production impact studies - e.g. to identify the principal disease or other factors contributing to low productivity of cattle, swine, poultry or crops.

- a model slaughterhouse data collection system

- economic impact assessments (e.g. impact of actual or hypothetical outbreaks of problems such as Moko Disease of Bananas[23] and Foot and Mouth Disease of livestock[24] in selected countries). As advanced studies in this field require a well developed database, the initial economic impact studies will be limited to areas where costs can be readily determined. Work on productivity assessment projects will with time lay the foundation for more advanced studies in this area.

  Possible topics for model projects are considered further under 3.2 below.

RECOMENDATION II

The **selection of projects** should be on the basis of:

- feasibility given the resources available

- impact in terms of increased productivity, increased trade, improved protection of public health or greater protection against foreign disease entry

- effectiveness of plans for the use of the information to be generated, including its dissemination to the intended users

- soundness of design from scientific viewpoint

- effectiveness in addressing two priority issues of the Canadian International Development Agency

(CIDA), namely:

1. providing assistance to small farmers and
2. improving the role of women in agriculture.

While on the topic of project management, we would point out that the responsibility for project design and management would rest with a national specialist, who would be supported by the regional centre in Trinidad & Tobago and our consultants from the University of Guelph. Each project would have a steering committee made up of national specialists and the IICA and CIDA staff. A mechanism should be established for this committee to obtain input from the producers concerned, possibly through membership on the committee.

RECOMMENDATION III

Establish a **network of plant and animal health epidemiologists** who, through a regional newsletter and regular workshops, would share information, methods and experiences in monitoring and surveillance for plant and animal diseases and pests.

RECOMMENDATION IV

Support national projects and the network through a **regional centre of expertise in Agricultural epidemiology** to be located in Trinidad & Tobago. The support to be provided would include:

- assistance for project design and review

- microcomputers (approx 10-12; IBM considered for reasons of software compatibility and availability of support)

- software: PANACEA[1] (an animal health and productivity data management package), commercial word processing, spreadsheet and graphics software, and possibly "PQDBase"[25] (a micro-computer database for plant quarantine applications available from FAO)

- advanced statistical analysis

[1] PAN Livestock Services Ltd. Department of Agriculture, University of Reading, P.O. Box 236, Reading, Berkshire, England.

- electronic mail and facsimile communications, through IICA's offices in the region. While the greatest benefit is expected to come from improved communications within the region, these tools can also be used to speed extra-regional contacts.

- training in epidemiology, data processing and project management. Training methods should include a newsletter, workshops and on-the-job training. We propose a quarterly newsletter and encourage the submission of relevant material effective immediately.

Initially this centre will operate from the IICA Office in Trinidad and Tobago. However, it is our intention that it should move to a permanent home in a suitable regional institution, possibly the University of the West Indies or CARDI, as soon as possible. A funding plan will need to be established, and this should preferably include contributions from the industries that would benefit from the information to be generated.

The centre should build strong links with CARDI, CAREC and the UWI Faculties of Agriculture and Medicine, in addition to its contacts with Ministry officials.

3.2. Identification of Information Needs and possible Model Projects

The region's wide variety of information needs can be defined in one dimension by considering the following classification of diseases and pests:

a. Serious diseases/pests foreign to the region

b. Diseases/pests subject to national control or eradication programmes

c. Diseases/pests that reduce production or increase post-harvest losses

d. Diseases/pests that impede trade

e. Diseases/Pests that threaten human health, including threats from the misuse of chemicals used to control pests and diseases

For each of these categories, there are several clients, each with distinct information needs:

- producers:
  - subsistence
  - commercial - local market
  - commercial - export market
- national regulatory / disease control agencies
- public and consumers re food hygiene (bacterial contamination, pesticide residues)
- importing and exporting countries
- regional, hemispheric and global agencies

a. **Serious diseases/pests foreign to the regions:**

The Caribbean currently enjoys freedom from some very serious diseases/pests. It is important to maintain this status. Countries must continuously be vigilant against the introduction of livestock diseases such as African Swine Fever or Foot and Mouth Disease. In terms of plant pests, exotic fruit flies and locusts come to mind as recent issues in this category.

Demonstrating the Value of Freedom

In these cases, disease control officials and responsible Ministers may face the difficult challenge of justifying the costs of preventing the entry of, or eradicating, these diseases and pests. This is an increasingly difficult challenge in an era of financial crises, when the only pay-off one can put forward for the investment is that no change will occur! To illustrate the value of this investment, it can be helpful to assess the economic consequences of a small, medium and large outbreak of the disease/pest concerned. Through the University of the West Indies and Agriculture Canada, we have access to professionals with experience in conducting such studies.

Reporting of Occurrences

International disease and pest reporting capability is available through the Office International des Epizooties (OIE) and the Food and Agriculture Organization's Caribbean Plant Protection Commission. Thus we do not propose to duplicate the functions of these agencies unless the national representatives attending this meeting can identify a means by which

these services could be complemented or enhanced. By strengthening national capability for disease and pest monitoring, this new regional project will necessarily assist countries in preparing information for submission to these international reporting systems.

b. **Diseases/pests subject to national control or eradication programmes**

Examples of major undertakings in this category are the plans to improve the control of tuberculosis in Guyana and to eradicate Amblyomma variegatum from Antigua, St. Lucia and Dominica. In these cases, our project might best be conducted in a manner to complement these programmes which will require effective surveillance systems.

c. **Diseases/pests that reduce production or increase post-harvest losses**

The production and economic impact of diseases and pests can be difficult to define. A traditional and costly route is to define the disease present (including incidence data) and then to measure their impact on production. We propose a less costly and perhaps more fruitful approach. This would begin by determining where the main production losses are occurring: at source (e.g. low egg or milk production), after harvest (e.g. losses in storage or transport), and so on. High and low risk populations can then be defined and disease/health states associated with these populations determined. This method would allow one to detect multiple causes of production losses (several diseases as well as management and economic factors may affect calf mortality or pre-harvest crop losses). This differs from the traditional method, where multiple effects of single diseases may be investigated (e.g. diarrhoea may cause death and poor growth rate in survivors). While requiring an investment in well designed, broad surveys, our proposed approach offers the advantage of focusing disease detection energies where they are most needed and have the best probability of significant and measurable impact.

Possible projects in this area include studies of dairy herd productivity in Trinidad and Tobago, and swine reproductive efficiency in St. Lucia.

d. Diseases/pests that impede trade

Here one might consider extensions or enhancements of projects to monitor for the presence of mango seed weevil, fruit flies or animal viruses such as CAE, bluetongue or pseudorabies.

Also proposed [13,26] are risk assessment studies to identify pests which could pose trade barriers that would interfere with crop diversification strategies of the region.

e. Public Health Issues:

With the increasing and world-wide public concern for environmental and public health issues, we must not overlook the matters of pesticide and drug residues or Salmonella, Campylobacter and other microbiological contaminants of foods. Caribbean countries must attend to these issues to protect their own populations. In addition, they should be seen to be active in this area with a view to ensuring tourists that their health is protected.

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Appendix I. General Recommendations from the North Carolina Feasibility Study

1. National programmes, and their integration into a regional programme, are feasible;

2. These programmes will contribute to agricultural development and independence

3. Early implementation recommended to build on enthusiasm generated by the feasibility study

4. Implementation should be done in a manner to "end the dependency on outside source's of input into internal concerns". That is to say that the focus should be on developing the expertise in each country to modify, adapt and write computer programmes to meet their specific needs as these evolve with time. Not said, but implicit in this recommendation is that each country needs to develop the capacity to define its information needs, design appropriate surveys or investigations, collect and analyze the data required to answer specific questions.

5. Develop centres of excellence in various disciplines to serve needs of the region, with the University of the West Indies playing the key role with support from outside consultants as required.

Introductory Principles and Considerations

1. Animal health data is needed to make more objective economic decisions leading to agricultural independence and potential export of produce.

2. Different countries have varied needs, thus implying the use of varied approaches to information systems in different countries.

3. Objective data to calculate prevalence, incidence, attack and case fatality rates, as well as economic impacts. This requires denominator (population at risk) as well as numerator (animals affected) data. Some present systems generate numerator data that should be integrated into any new system.

4. Information should serve the producer, national and regional needs, in that order (if not meeting needs at the input and intermediate levels, can predict breakdown).

5. To gain industry support confidentiality of information collected on each flock/herd must be ensured (except for diseases subject to regulatory control)

6. Lab support will be essential, and it is proposed to use current national labs backed up by centre of excellence labs.

7. Attempts should be made to use Animal Health Monitoring procedures as the basis for zoonotic disease surveillance.

8. Immediate reward will not be visible or dramatic, and benefits will only be appreciated in the long run.

9. Benefits from the effort will depend to a large extent on the degree of cooperation amongst the countries in order to share a) scientific resources (centres of excellence concept and b) information gathered through their reporting systems. The latter point requires some agreement on protocol for reporting data that could be used as a basis for non-tariff trade barriers - suggest OIE approach).

10. Information should include:

    - indices of disease and risks for various species
    - warning system for exotic diseases
    - random sampling of selected populations
    - disease risk factor analysis
    - economic analysis
    - computerized evaluation and simulation of disease patterns by geography, time, etc.
    - monthly and annual summary reports.

Appendix II. Recommendations on Regional System from the North Carolina Feasibility Study:

1. Build on individual national programmes, after procedures are developed and debugged at the national level.

2. Funding of regional effort by intra-government appropriations supplemented by grants from International agencies.

3. Based on a centre of excellence in epidemiology and statistics:

   - extra costs
     - computer (IBM AT)
     - personnel (1-2)
     - statistical software
     - consultants

   - supports provided
     - epidemiological advice
     - statistical support
     - special investigations.

4. Propose other centres of excellence by species and by scientific disciplines as well as in economics.

5. Data roll up reports on disease incidence:

   - first by clinical signs (less expensive and more available)

   - selected lab confirmation by sampling high risk cases

   - also add
     - laboratory data
     - slaughter house data.

6. Design systems to collect specialized data suitable for cost benefit studies of prevention, intervention or control (under auspices of centre of expertise in economics).

7. Must include a warning system for epidemics and for exotic diseases.

Appendix III. Summary of Potential Projects from the North Carolina Feasibility Study:

A. Development of an Animal Health Data Monitoring System (AHDMS) based on clinical signs

- St. Vincent, Grenada, Dominica, St. Lucia

B. In depth investigation monitoring system.

- St. Vincent, Grenada, Dominica, St. Lucia

C. Improve diagnostic capabilities

- St. Vincent, Grenada, Montserrat, Dominica

D. Slaughterhouse examinations

- All countries

E. AHDMS - Diagnostic laboratory-based system

- St. Lucia, Trinidad, Belize

F. Strengthening extension services

- St. Lucia, St. Kitts/Nevis, Montserrat, Dominica

G. AHDMS on dairy operations, include mastitis programme

- Guyana, St. Kitts/Nevis, Suriname, Barbados, Belize, Montserrat

H. AHDMS - subsistence livestock farming

- St. Kitts/Nevis, Dominica, Grenada, St. Lucia

I. Development of zoonotic disease registry

- St. Kitts/Nevis, Trinidad/Tobago

J. Mycotoxin (aflatoxin) in animals and human populations

- St. Kitts/Nevis, Suriname

K. AHDMS - Utilizing tick eradication programmes

- Antigua, St. Kitts/Nevis, St. Lucia

L. Coordination of multiple projects for AHDMS

- Antigua, Montserrat

M. AHDMS - poultry industry

- Suriname, Barbados, St. Lucia, Jamaica

N. Develop a nutritional support system

- Suriname, Grenada, Trinidad/Tobago, Jamaica, Belize

O. Centre of Excellence - mycotoxins

- Suriname

P. Computerization of the diagnostic laboratory records

- Barbados, Trinidad/Tobago, Jamaica, Belize, Guyana

Q. Training computer operations, programming and logistics

- All countries

R. Mastitis control programme for the dairy industry;

- Guyana, Barbados, Trinidad/Tobago, Jamaica, Suriname

S. Reproduction control programmes

- Barbados, Trinidad/Tobago, Jamaica, Guyana

T. AHDMS - for Jamaica's needs

- Jamaica

U. AHDMS - for the swine industry

- Barbados, Belize, Guyana

V. Promotion, adoption and implementation of record-keeping systems

- Barbados and the other interested countries

W. Centre of Excellence - residue testing programme

- Belize

X. Development of aquaculture

- Dominica, Jamaica, Guyana, St. Lucia

IV. NATIONAL PRESENTATIONS

Chairman: Dr. Chelston Brathwaite

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PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN BARBADOS

ANIMAL HEALTH - MAIN ACTIVITIES

1. Bluetongue studies

Activity in this area has been ongoing for a number of years through the auspices of IICA. Currently sheep are bled monthly at three different locations. Samples are forwarded to Costa Rica where they are tested as part of a regional programme.

2. Caprine arthritis encephalitis (CAE)

This regional study got underway recently. Some islands are showing a low rate of infection eg. Antigua, while Barbados itself reveals an 80% seropositive incidence.

3. Tuberculosis testing

This is an ongoing programme since 1977 when an outbreak occurred in a single herd of cattle. Two island wide "sweeps" have been conducted and commercial herds are still tested annually. Sheep/pigs/goats have been tested to satisfy export requirements. No further cases of TB in any species have been identified in the past 10 years.

4. Leptospirosis

In conjunction with the MRC of U.K., studies have been underway for the past 5 years in both the animal and human population. L. fort bragg and L. autumnalis var bim are the two most common serovars.

5. Mycoplasma in pigs

This survey was initiated two years ago and involves culture as well as serology.

PLANT PROTECTION - MAIN ACTIVITIES

1. Fruit flies - mainly Anastrepha and Ceratitis spp.

Surveys using McPhail and Jackson traps were initiated in 1985 to determine whether fruit flies of economic importance were present in Barbados. Training for the trappers, as

well as baits and traps used in the surveys, were provided by USDA/APHIS. Traps were set up in every parish on a wide range of fruit trees, but particular emphasis was placed on the ports of entry. To date no economically important fruit flies have been collected, suggesting that Barbados is free of these important pests. The survey is continuing.

2. **White flies - namely *Bemisis tabaci***

White flies destroyed a couple fields of cotton in 1987 and since then almost every crop except sugar cane has been severely affected. Attempts at control have so far met with only limited success. A comprehensive control strategy is now being implemented in an attempt to reduce damage levels.

3. **Locusts (*Schistocerca gregaria*)**

Desert locusts arrived in Barbados and the Caribbean on the winds of hurricane Joan in October 1988. Barbados' eastern and northern parishes were heavily infested on two separate occasions one week apart. Massive survey and eradication campaigns have been launched but the results of these efforts are still unknown. A programme is being set up for monitoring of population levels and biological studies, relating particularly to behaviour, reproduction and food preferences, just in case the insect is not controlled quickly.

4. **Anthracnose disease on yams (*Colletotrichum* spp. and *Diplodia* sp.)**

Yam is an important export crop in Barbados and for the last 5 to 6 years the crop has been devastated by anthracnose disease.

Efforts are presently being made to address this problem. One component of the programme is the island wide survey of yam fields. In addition, a wide range of fungicide combinations are being tested for efficacy against this disease.

5. **Bunchy top disease of Papayas (*Myoplasma* sp.)**

Almost 4 to 5 years ago, papaya plants in Barbados were severely affected by bunchy top disease and most plants were eventually killed. A programme was mounted in collaboration with IICA to screen varieties which exhibited resistance or tolerance to the disease. Some of these varieties are presently being grown but resistance seems to break down after about 2 or 3 years. Varieties continue to be examined as pesticides are screened against the primary vectors, *Empoasca* spp. (leaf hoppers).

NATIONAL SURVEILLANCE AND DISEASE MONITORING

What is most essential is the development of a more sophisticated Agricultural Quarantine Inspection Service which serves the interests of both plant and animal health. Currently there is input at the ports of entry covering both areas but staff shortages and effective training are the two major areas to be addressed to effect a fully integrated and efficient service. We see this as a priority area and have held recent meetings to discuss organization and rationalization.

With regard to animal health surveillance, it is considered that much valuable disease information is lost by having no involvement in the area of meat inspection and particularly on the kill floor. To this end, the Veterinary Services of the Ministry of Agriculture will be assuming the responsibility of ante and post mortem inspection in both red and white meat slaughter plants once the new Slaughterhouse Act is enacted. Our involvement will be part of a national meat hygiene programme working alongside the Veterinary Public Health Inspectorate of the Ministry of Health who, in turn, will look after other areas of meat hygiene such as processing, storage, retailing, etc. Assistance in training and inspection is therefore required as the course presently being taught at the Community College in Barbados needs to be considerably upgraded.

We consider a disease information system essential and one which should be in a format allowing for maximum utilization of the facts and statistics as presented.

RESOURCES FOR ANY PROJECT

It is most unlikely that the Ministry will hire additional personnel and usually any new projects are expected to be carried out by already overburdened senior technical staff.

IBM PC computers are available for use.

NATIONAL PROJECT CO-ORDINATOR

To fulfil the requirements as indicated, it means the Chief Agricultural Officer of the Ministry of Agriculture would have to be the individual managing the local component of any regional project. For animal health, a veterinary epidemiologist as a short-term consultant would be most helpful in getting any such project off the ground.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN BELIZE

PLANT PROTECTION

1. RELATED ACTIVITIES CURRENTLY UNDERWAY

Activity	Monitoring	Economic Impact
Assessment		
a. Survey of _Anastrepha_ spp. in mango (as background to developing protocol for hot water treatment)	X	X
b. Medfly trapping	X	
c. Integrated Control of Diamond Back Moth in cabbage	X	X
d. Moko Control Program	X	
e. Monitoring Nyndus Crudus (Lethal Yellowing vector in coconuts)	X	

2. NATIONAL PRIORITIES FOR PEST AND DISEASE MONITORING ASSESSMENT

Pest/Disease	Monitoring	Economic Impact
Assessment		
Medfly	X	
Anastrepha spp. (Multiple hosts)	X	X
Mango Seed Weevil	X	X
Dacus spp. (Oriental Fruit Fly)		X
Moko (not yet in commercial banana)		X

Pest/Disease	Monitoring	Economic Impact
Bruchids and Sitophilus (post harvest)		X
Fall Army Worm		X
Red Ring/Palm Weevil		X

There is a strong need for impact assessment on existing, damaging pests, e.g., coconut mite, drunken baymen - Trigona (stingless bees), leaf cutting ants, Fall Army worm, sugar cane frog hopper, Bruchids and Sitophilus weevils (post harvest). Though this would serve to motivate and direct extension and research, the major constraints are economic and manpower resources needed.

3. RESOURCES

The economic and personnel resources of the Plant Protection Section are already over-committed, and at present it is not possible to identify the resources required to address the needs identified above.

4. NATIONAL PROJECT CO-ORDINATOR

The Veterinary Investigation Officer in the Ministry of Agriculture would be our National Project Co-ordinator.

5. RECOMMENDATIONS

There is a need for general information of the sort provided in the Caribbean Plant Protection Newsletter. The exchange of information updates on the status of pests and disease on a regular and frequent basis would be beneficial.

ANIMAL HEALTH

1. RELATED ACTIVITIES CURRENTLY UNDERWAY

Activity	Monitoring	Surveillance
a. Tuberculosis Testing - We test all dairy cattle on a yearly basis. Beef - mainly at slaughter	X	

Activity		Monitoring	Surveillance
b.	Bovine Brucellosis - We test all dairy cattle at the time of TB testing All reported abortions are investigated	X	
c.	Bluetongue - a structured survey is being carried out in association with Caribbean and Central American countries		X
d.	Paralytic Rabies - all neurological cases are investigated		X
e.	Vesicular Disease - all vesicular disease cases are investigated and samples are sent to Panama for confirmation of diagnosis		X
f.	Classical Hog Cholera - all suspected cases are investigated and confirmation of diagnosis is sought at U.S.A. laboratories		X
g.	Poultry Diseases - all outbreak of infectious diseases are investigated		X

2. NATIONAL PRIORITIES FOR PEST AND DISEASE MONITORING

Monitoring

a. Brucellosis — (a) and (b) need structured programs including diagnostic reagents, manpower and supportive services

b. Tuberculosis

Surveillance

a. Vesicular Diseases

b. Classical Hog Cholera

c. Poultry Diseases (esp. Newcastle)

d. Leptospirosis

e. Parvovirus in Pigs

Economic Impact Assessment

a. Causes of low calving rates in cattle in the country

b. Economic impact of internal and external parasites (including ticks)

c. Paralytic rabies in livestock production in specific areas

d. Vampire bat on livestock production

e. Determine the serological status of livestock with regard to BVD/MD and IBR/IPV in Belize and its economic impact

f. Mycoplasma survey in Poultry and Pigs

3. RESOURCES

Our economic and personnel resources are fully committed. At present it is not possible to identify the resources required to address all the activities on the list of National priorities.

4. NATIONAL PROJECT CO-ORDINATOR

The Veterinary Investigation Officer in the Ministry of Agricultural would be our National Project Co-ordinator.

5. RECOMMENDATIONS

Plant Protection and Animal Health are separate sections and for this reason it would be good to have one computer for each section. Any computer assigned to Belize should be either IBM or fully IBM compatible.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN GUYANA

1. RELATED PROJECTS UNDERWAY OR PROPOSED

1.1 Bovine Tuberculosis

Bovine Tuberculosis occurs in Guyana and high rates of infection are suspected in the eastern coastal regions. A survey is currently underway to determine the distribution and prevalence of this disease in the coastal cattle population. This will be followed by a programme of control and eventually eradication of the disease.

1.2 Caprine Arthritis - Encephalitis (CAE)

Guyana is participating in an Eastern Caribbean survey. Sera will be taken from 100 goats and will be examined in Barbados for antibodies.

1.3 Bluetongue

Guyana is one of seven Caribbean countries participating in the Bluetongue survey. Sera taken from cattle will be screened in Barbados.

1.4 Small Ruminant Trypanosomiasis

Following the accidental observation of trypanosomes in a lamb at the Veterinary Diagnostic Laboratory, a survey was mounted to assess the prevalence and distribution in sheep and goat flocks on the coast. _Trypanosom_ _vivax_ _viennei_ has been identified as the infecting organism.

1.5 Avian Mycoplasmosis

A serological study of the rate of _Mycoplasma_ infection in poultry flocks began in 1987 and will be concluded in 1989. This study is being conducted in Demerara (Reg. 4).

1.6 Guyana Oriental Fruit Fly Project

The Plant Quarantine Unit of the Ministry of Agriculture, Guyana, with assistance from the Commission of European Communities, commenced a survey to detect the Oriental fruit fly. The project commenced in May 1988 and is concentrated in East Berbice (Reg. 6), near the Suriname Border.

No flies have been found to date and the project is expected to be completed by December 1988.

1.2 PROPOSED PROJECTS

2.1 Extension of the Oriental Fruit Fly Project

The above project will be extended in January to encompass Region 4, East Demerara including Timehri Airport, West Coast and West Bank Demerara (Reg. 3).

2.2 Country-wide Survey for the Identification and Distribution of *Anastrepha* spp.

At the moment no information is available as to their identity, distribution or fruits infested.

2.3. Mango Seed Weevil Survey

The mango seed weevil has been detected in some countries of the Caribbean, and following a recent workshop in Barbados, Guyana has decided to investigate the presence of this pest here through a coastal survey.

2.4 Control of Mealy Bug on Pineapples

The mealy bug *Dysmicoccus brevipes* is a common pest of pineapples in Guyana and has an adverse effect on its potential for export to the Caribbean. Studies are proposed to determine the best method of fumigating the fruit prior to export, utilising a chemical with a 2 - 3 day residual effect.

2.5 Production Monitoring Systems

The Planning Department of the Ministry of Agriculture provides monthly production figures for animal (milk, beef, etc. and plant products - rice, legumes, edible oil, etc.). Data is obtained from the abattoir and field staff at monthly and quarterly intervals.

2. NATIONAL PRIORITIES FOR PEST AND DISEASE MONITORING

The Veterinary Field Services Unit is the arm of the Animal Services Division responsible for monitoring and gathering data on livestock diseases. It is also responsible for mounting campaigns to contain and eradicate outbreaks of diseases particularly those exotic to Guyana. The Unit obtains information from the abattoir, and from monthly field and

laboratory reports.

The current bovine T.B. survey has been identified as a priority by the Unit.

Pests and diseases of crops are monitored by the Extension Division of the Ministry of Agriculture and the Field staff of the Ministry of Regional Development.

3. RESOURCES

Livestock:	2 veterinarians; 2 animal health technicians
Crops:	1 Agricultural Officer, 13 technical assistants
Computer:	1 IBM PC XT with Lotus 1, 2, 3 and Wordstar programmes, and 2 operators

4. NATIONAL PROJECT CO-ORDINATOR

Chief Crops and Livestock Officer - Mrs. Elsie Croal.

5. RECOMMENDATIONS

That each country has access to each other's animal and plant health information as may be necessary.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN JAMAICA

CURRENT STATUS

Currently, there are several ongoing programmes aimed at disease control and monitoring and ultimately the improvement in productivity of the livestock sector.

The major programmes are the National Brucellosis and Tuberculosis Control and Eradication Programme, which includes field, laboratory and slaughterhouse monitoring components, and the National Leptospirosis Control Programme which is undertaken in conjunction with the Veterinary Public Health Unit of the Ministry of Health and Environment. The Veterinary Diagnostic Laboratory at Hope has been designated the National Leptospirosis Laboratory and hence monitors both human and animal leptospirosis. There are also programmes in mastitis control and cattle fertility. In addition, CAE, pseudorabies and hog cholera surveys have been initiated. Jamaica also participates in the current regional screw worm survey programme.

Plans are well ahead for a re-organization of the Meat Inspection and Monitoring services. These plans include the newly promulgated Meat Inspection Act which effectively designates the veterinary services as the competent authority for meat inspection, in keeping with international trends. A meat residue monitoring system is also being put in place with the necessary equipment already secured. This particular laboratory could well be developed as one of the proposed centres of excellence being suggested to serve the Caribbean area as a whole as we move towards the development of local expertise and capabilities.

Jamaica has also recently overhauled the animal quarantine monitoring system with the incorporation of more stringent import and export regulation rules and practices.

There is also in place for several years now an Animal Disease Emergency Preparedness System as a major response to the possibility of exotic disease introduction into the country. Jamaica also participates in reportable disease monitoring systems in conjunction with the Caribbean Regional Epidemiology Centre (PAHO) and FAO.

In terms of information systems there is in place a central filing system fed by a parish network with monthly and annual reports. Because of overload and other problems this system requires an urgent changeover to a computer-based one.

While it is probably true to say that a tremendous amount of data has been generated over the years it is also true that this data to a large extent remains uncollated, unevaluated and with severe dissemination and feed back problems. These are in addition to the obvious misdiagnosis and under-reporting of disease conditions. Jamaica has agreed to support and participate in the newly proposed Animal Health Information and Data Monitoring System.

CONSTRAINTS

The constraints to the present animal health monitoring system are many and varied. The two major ones being:

1. Lack of laboratory and field personnel with the necessary expertise. This is probably the most critical factor at this point in time as the attrition rate of both veterinary and other technical personnel accelerates at a rapid pace due mainly to conditions of work and inadequate remuneration.

2. Lack of or reduced governmental support. This, although probably a universal phenomenon, is particularly severe in Jamaica and has served to either eliminate or drastically reduce ongoing programmes or to prevent the initiation of new and needed projects.

Other problems include the lack of adequate integration and rationalization of the resources, personnel, equipment, etc. of inter-governmental agencies. Problems of implementation, evaluation, data processing and adequate feed back, especially to rural and small livestock owners, have created problems for the system.

PRIORITY AREAS OF CONCERN

The following are some of our immediate concerns.

1. The need for more adequate linkages between national monitoring centres and internationally recognized centres in terms of updating and referencing etc.

2. Greater effort towards epidemiological surveys to provide more meaningful profiles or baseline data on the more important disease entities.

3. Creation of a more effective feedback system to both technical and field personnel and livestock owners.

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2. Greater effort towards epidemiological surveys to provide more meaningful profiles or baseline data on the more important disease entities.

3. Creation of a more effective feedback system to both technical and field personnel and livestock owners.

4. New methodologies and approaches to analyze production and monitoring systems already in place and to activate relevant and proper studies.

5. New approaches to relate these monitoring systems to the public health implications and the practical, economic impact in an attempt to impress policy and decision makers and the ultimate consumer of our efforts, the livestock farmer, through relevant and accurate information.

PROJECT PROPOSALS

1. Developing relevant profiles on baseline data on local disease conditions which have public health, national economic and international trading significance.

2. Computerization of current and future data so as to facilitate proper storage and effective collation, dissemination and feedback efforts.

3. An approach to adequately utilize the information generated.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN MONTSERRAT

1. RELATED ACTIVITIES CURRENTLY UNDERWAY

PLANTS

1. At present there are regulations controlling the entry of fruits, vegetables and other planting materials which are monitored by Agricultural Officers at ports of entry.

These are being updated under the Caribbean Plant Protection Model.

A few highlights of these are:

a. Permits have to be obtained for importation of large quantities of fruits and vegetables.

b. Small quantities must be accompanied by phytosanitary certificates and must be inspected at point of entry.

c. Some products are totally banned (e.g. mangoes and coconuts).

2. Plans are afoot, despite Montserrat's colonial status, to seek benefits and assistance from FAO, IICA, etc. and to participate in regional programmes (e.g. fruitfly survey).

3. The Production Co-ordination Unit (PCU) is a data collection and collation system which relates the farmers' acreages, planting and expected harvest with the present and future market availability, so as to assist in developing marketing strategies to meet the output.

4. The Locust: Schistocerca gregaria were first seen in Montserrat on the October 15th, 1988. Where they were seen in large quantities spraying was done with a pyrethriod (Karate) and an organochloride (Diazinon). There appeared to be a dramatic reduction in population of the locust due to predators (birds).

ANIMALS

Montserrat is in the process of:

a. Tagging its livestock, mainly cattle, pigs, donkeys and horses.

b. Building up a random serum bank of 10% of the population which will be used in a serological survey to test for the absence or presence of selected diseases.

c. Developing a farmer, farm and animal distribution profile to be used for:

(i) Monitoring disease levels - set baseline identification for common diseases.

(ii) Developing a production guide to maximise the farmers' output

(iii) Assist in developing educational materials, and workshops/seminars to assist farmers with their problems.

(iv) Assist in identifying the limited resources for production.

(v) Assist in identifying research needed for Montserrat's farmers.

d. Making slaughter house records more meaningful so as to assist in:

(i) Measuring farm outputs viz country's needs

(ii) Disease monitoring

(iii) Assessment of the reproductive potential of the female population.

2. NATIONAL PRIORITIES FOR PEST AND DISEASE MONITORING

PLANTS

1. The establishment of quarantine facilities at the ports of entry:

a. Inspection

b. Preparation of samples

c. Retention

d. Disposal of condemnations

2 The need for training customs officers on quarantine matters to become the first line of defence.

3. Training of Agricultural staff on quarantine matters and recording data.

4. Need to develop the data base for regional disease monitoring, notification of disease outbreaks and to develop a system to predict outbreaks.

5. Need for a general pest and disease survey.

ANIMALS

1. Developing the animal disease monitoring system.

2. Developing the farmer and farm profile to assist in increasing production, once we identify limiting factors.

3. Developing parameters to direct the formulation of livestock policies aimed to assist the growth and profitability of the livestock industry.

3. RESOURCES REQUIRED - PROJECT TO SUPPLY (INITIALLY)

1. Would need computer hardware and software.

2. Would require a building or room to house this - or renovation of an existing room to accommodate this.

3. The Ministry will supply:

   a. Personnel for the relevant data collection

   b. Personnel for the entry and calibration of this activity

   c. Necessary stationary and services needed; telephone, telex, electricity, etc.

4. NATIONAL PROJECT CO-ORDINATOR WILL BE

The Chief Veterinary Officer
Dr. Garry B. Swanston, B.Sc. - Agriculture
DVM - Veterinary Medicine

Plant Protection Officer
Mr. John Greer, B.Sc.
Agricultural Officer I

5. REASONS WHY MONTSERRAT WOULD PROVIDE A GOOD INITIAL SETTING FOR THE ANIMAL AND PEST PROJECT

ANIMALS

1. We have been developing our own with the North Carolina State University

2. Our size of farms and herds and tagging system

PLANTS

We have developed a farmer register and mini profile and therefore just need to expand the Production Co-ordination Unit to incorporate the Pest/Disease Monitoring System

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN ANTIGUA AND BARBUDA

1. ANIMAL

ORGANISATION:

The Chief Veterinary Officer is the head of the Veterinary and Livestock Division of the Ministry of Agriculture, Fisheries, Lands and Housing. He supervises the animal health assistants, agricultural assistants and non-technical staff.

LEGISLATION:

Legislation in effect:

a. Animals (International Movement and Disease) Act, 1986, which governs the movement of animals, animal carcasses and other things including biologics of animal origin. This control is not confined to the transmission of disease through movement, but includes animal safety, quarantine stations and statistics.

b. The Veterinary Act, 1986, governs the behaviour and provides a code of ethics for Veterinarians and animal health assistants.

c. The Foot and Mouth Disease Regulations. This comes into force in the event of an occurrence of Foot and Mouth Disease.

d. The Diseases of Animals (Swine) Regulations. This is for the control of specific diseases in swine.

e. Other legislation for which the Veterinary and Livestock Divisions have joint responsibilities are:

   (i) Cattle Trespass Act

   (ii) Dogs Act

   (iii) Protection of Animals Act

   (iv) Slaughter of Cattle (Control) Act

   (v) Wild Bird Protection Act

INSPECTION

Field:

The island is divided into zones in each of which an animal health assistant is assigned to advise farmers about animal health and husbandry, animal breeding and control and eradication of diseases, etc. The animal health assistant's work is supervised by veterinarians, each of whom oversees half of the country, and reports to the Chief Veterinary Officer.

Ports:

The island has four main ports of entry: St John's Port; Coolidge Airport; Nelson's Dockyard; and Parham Sound (Crabbs).

Import/Export

Under the Act, the Minister is empowered with authority to prohibit the importation or exportation of animals, animal carcasses and other things in certain cases on the recommendation of the Chief Veterinary Officer. Legislation is in place to control the importation and exportation of animals, animal products and other materials.

Public Awareness Campaign

From time-to-time, programmes are carried on local radio and television stations, to inform the public of the dangers of the importation of animals, animal products and biologicals without approval of the Chief Veterinary Officer and his staff.

Problems and Constraints

There have been reported cases where veterinary biologicals, including parenteral antibiotics, are being imported by pharmacies and sold to farmers without prescription. Unfortunately, Caribbean countries generally lack the sort of control exercised by the U.S. Food and Drug Administration whereby drugs are specifically marked to identify those which require veterinary surveillance. The end result is that we find medical resistance in the field.

Another constraint is that of staff. Other constraints include: the control of drugs, due to piecemeal importation; lack of interaction between the disciplines of human medicine and health workers, and even agricultural workers resulting in minimal transfer of information; lack of appreciation of the importance of Animal Health, as it relates to human health; and the financial constraints, so evident in the Caribbean.

While Antigua/Barbuda has accepted the proposal for information systems to monitor food production, disease surveillance, disease prevention and disease eradication, the constraints mentioned above limit its wide use and development.

Finally, it must be noted that while our concern and discussions are more for monitoring and surveillance, mini-states, quite often, perforce cannot carry out all phases, ie. the execution of service also. It is hoped that in time these constraints will be removed.

2. PLANT

PERSONNEL IN PLACE

One (1) Plant Protection Officer

One (1) Field Scout

Five (5) Plant Quarantine Inspectors

Two (2) Sprayers

One (1) Office Clerk

At present no graduate staff is in the unit

Transport: One double-cab pick-up truck

LEGISLATION

Currently in force are Plant Quarantine Regulations dating from 1941.

A study is being made of Dominica's Plant Quarantine Regulations which are based on an FAO model with a view to updating.

Regulations for Antigua and Barbuda.

INSPECTION

Scouting is carried out on a daily basis in the several cotton-growing areas in search of pests such as Pink Boll Weevil, Bug Stamin and Zepidopteras. Immediate spraying is done on sighting of any of the above pests.

Inspection, Quarantine

A monthly roster system is in operation, and stations are manned at the V.C. Bird Airport Cargo Warehouse and the deep water harbour, from 8.00 am to 10.00 pm. At the Point Wharf, where island Schooners embark, inspections are made on Monday, Tuesday and Wednesday.

Import/Export

Import licences are issued by the Director of Agriculture. Sanitary certificates are issued by the Plant Protection Officer, Quarantine Inspectors and the Director of Agriculture.

Public Awareness

Announcements are carried out on radio and television stations whenever new pests invade the island in large numbers.

Problems

a. The lack of an incinerator. At present confiscated material is burned using old tyres.

b. Lack of trained graduate staff. Recommendations are in process to have vacancies filled in 1989.

c. To have Quarantine Staff trained at ECIAF, and be placed in permanent positions.

d. Recommendations have been made to the Ministry to equip all officers with a hand lens, torchlight, etc.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN DOMINICA

PLANT

The Plant Quarantine system in Dominica is headed by a Plant Protection Officer in charge of the entire plant protection unit. He is assisted by a Plant Quarantine Supervisor, who, in turn supervises the plant quarantine inspectors currently employed.

Plant Protection Officer

Plant Protection | Plant Quarantine Supervisor

Fruitfly project | Rodent Control Programme | Plant Quarantine Inspectors

Lab Assistant

LEGISLATION:

The Plant Protection and Quarantine Act 1986. This act provides for the protection of the agricultural resources of Dominica from dangerous pests and diseases. This act is based on the FAO draft model legislation, and some of the sections included are as follows:

- Application for and restriction on issuance of permits
- Minister may by order take steps to prevent the spread of plant pests
- Establishment of the plant protection and quarantine services
- Establishes the powers of the plant protection and quarantine services
- Penalties
- Provision for the development of

regulations.

Draft regulations have been submitted for approval and parliamentary enactment.

INSPECTION:

Field

Field inspections are not carried out by the Plant Quarantine Inspectors but the supervisor who is also knowledgable in other Plant Protection matters usually forms part of the Plant Protection team visiting farms/plots and organising farmer advisory clinics dealing with phytosanitary concerns.

Ports:

There are five ports on the island and four have permanently assigned plant quarantine inspectors. At the airports hand-baggage inspection and export certification is due by means of issuing phytosanitary certificates to persons taking plant products out of the country, thus ensuring that entry requirements of importing countries are met.

In an effort to facilitate the huckster trade between Dominica and neighbouring countries there are twice weekly visits by inspectors to the main harbours where the produce is inspected and a phytosanitary certificate issued before the loading onto ships.

At the ports no regularized inspections of ships and planes take place to ensure compliance with existing quarantine measures.

Import/Export

- Phytosanitary certificates are necessary for the export of all plant products produced in Dominica.

- For import, applications for permits to import plants and plant products should be made four (4) weeks in advance, in writing and addressed to the Plant Protection and Quarantine Unit - Dominica.

PUBLIC AWARENESS CAMPAIGN

Use of the radio through the programmes run by the information unit of the Division of Agriculture is an important source for the dissemination of information to the public.

The local newspapers also serve this purpose. We have, on many occasions resorted to the use of posters and other pamphlets to get messages to the public.

There is currently a programme of quarterly lectures arranged for the benefit of members of the Dominica Hucksters Association in an effort to increase awareness of their role in maintaining and observing required quarantine practices, and to build a better working relationship with the quarantine inspectors.

PROBLEMS AND CONSTRAINTS

We will attempt here to list some of the problems/-constraints.

1. Facilities and equipment
2. Personnel
3. Training requirement for officers and inspectors at different levels
4. Transport
5. New legislation and regulations.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN GRENADA

ORGANISATIONAL STRUCTURE

Pest Management Unit

Pest Management Officer	-	1
Plant Quarantine/Crop Protection Officers	-	7
Laboratory Technician	-	1
Agricultural Instructor (1 in Carriacou)	-	2
Fruit Fly trappers	-	2
Total	-	13

Plant Quarantine Personnel

- Eight officers were trained at Maryland, U.S.A., including one from the Veterinary Division.

- One officer received training at the seaports and airport in Miami, Florida.

- In October of 1986 a training course on plant quarantine was held in Grenada for 24 participants, including customs and marketing personnel.

All officers were trained both in plant and animal quarantine.

Inspection Services.

At the airport, full-time inspection service is in place, with 2 officers from the Pest Management Unit and 2 from the Veterinary Division working on a shift system.

The two seaports are serviced from Monday to Friday. No provision is made for weekends. The yacht basin is inspected at least once a week.

Import

All persons wishing to bring agricultural products into the country must obtain an import permit from the Pest Management Unit at least one week in advance. Permits are issued by plant quarantine officers.

Export

Agricultural products leaving the country are inspected by officers and phytosanitary certificates are issued. For the huckster trade, officers visit the ports every Tuesday to inspect agricultural products and issue certificates.

Legislation

Our Plant Protection Act has been updated and plant quarantine regulations based on the FAO model are in place.

Survey, Monitoring & Diagnostic Services

- Fruit-fly post-survey monitoring activities continue. Funds for these activities (by USAID) will be depleted by June of 1989. The Ministry of Agriculture is expected to continue the programme from there on.

- Mango seed weevil surveys are carried out every year during the mango season. (May - September).

- Very little diagnostic service is being provided at the moment because of the lack of trained personnel. There is a need for upgrading in this area.

Public Awareness

This includes:

- Distribution of pamphlets

- Placement of posters at seaport and airport

- Articles in the agricultural newsletter "Grenadian Farmer"

- Interviews and announcements on an agricultural radio programme.

Problems and Constraints

- There is need for on-going training of officers of the Ministry, Customs, Port Authority, etc.

- There is need for more public awareness programmes.

- There is need for disposal facilities at the seaport.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN ST. LUCIA

ANIMAL

Presently, the Animal Health Division is involved in the following work areas.

Field work

- Emergency (poultry included)
- Farmer daily calls (individual)
- Islandwide herd health clinics
- Egg monitoring board (with livestock)

Laboratory work

- Gross pathology (histo-pathology imminent)
- Bacteriology (need reference strains, antigens, campylobacter system)
- Parasitology
- Haematology
- Blood Chemistry

ORGANIZATION

ADMINISTRATIVE

Chief Veterinary Officer

MAIN OFFICE - (Union North)

Veterinarians	2
Animal Health Assistants	3
Laboratory Technician	1
Assistant Laboratory Technician (no formal training)	1
Clerk/Typist	1

BEAUSEJOUR OFFICE - (Vieux Fort South)

Veterinarian	1
Animal Health Assistants	5

Regulatory and Quarantine

Trade in poultry, live animals, meat and meat by-products, and hatching eggs are subject to the following, according to the circumstances.

- Restricted country list (O.I.E.)
- Stated conditions for importation
- Import Permit, Health Certificate/Certificate of Wholesomeness
- Inspection (Customs)
- Detention, confiscation (Customs)
- Port visits (Veterinary staff)
- Disposal (incinerator pending) by Veterinary staff
- U.K. - Standard Import Permit - OECS

Regulations are in place should they be required to deal with outbreaks of:

Rabies
FMD
Brucellosis
T.B.
Newcastle, AI.

Legislation is pending for Amblyomma and Dermatophilosis.

Special (specific) work areas

The following are agency funded projects.

- Amblyomma tick, and dermatophilosis eradication project (IICA, FAO, OAS) ongoing.
- Caprine Arthritis Encephalitis (IICA) complete
- Bluetongue (terminated).
- Newcastle disease (Private/USDA/St. Lucia) (Abeyance)
- Sheep anthelmintic trial (CARDI)
- Poultry and swine enhancement/support programme

Implementation of the Amblyomma tick eradication project began in July, following a comprehensive survey by the FAO. Implementation of the project specifically as recommended by the FAO team was not possible, due to lack of complete resources. In the interim (pending FAO funds), the Division decided on at least some form of control. Help in the form of acaricide and emoluments (summer student) was received from IICA, and the Government of St. Lucia provided a vehicle.

In the northern infested area of 75 sq. miles comprising the 350 small farms, 3,000 cattle, 1500 sheep and 100 goats have so far been tagged, registered and treated (at least four treatments so far). The project has not been as successfully implemented in the South, because of a chronic lack of transportation. The Amblyomma eradication project should by the nature of its logistics, be a full time job. Presently we deploy four (4) animal health assistants (AHA's) on a rotational basis four days each week. The AHA's also respond to farmer calls and conduct clinics and port calls. We have prioritized and organised these activities, but the project and the Veterinary Services would operate more efficiently with full time workers assigned to the Division.

In addition to the risk of running out of acaracide and a shortage of money to obtain the drug, there is a real problem of compiling the weekly data into useful reports. Proper co-ordination would improve our cost and time/effectiveness, monitoring and organization.

The main stumbling block is the amount of paper work involved. There is no other way to collect the raw data. One to three forms are produced for each farm every two weeks, resulting

in 350 forms every two weeks.

National priorities for animal disease monitoring

The main priority areas identified have been characterised as production diseases, zoonotic and food related diseases and exotic diseases.

1. <u>Production Diseases</u>

   a. Poultry and Swine

      - Reproduction related problems - pigs
      - Nutrition related problems - Pigs
Poultry
Fungal
      - Leg problems broilers
      - Colibacillosis
      - Hatchery
      - IBD
      - Reovirus, Adenovirus
      - CRD, Coryza
      - Vaccination programme - Poultry
Swine

2. <u>Zoonosis and Food Borne Illnesses</u>

      - Salmonella
      - Toxoplasmosis (goats)
      - Campylobacter
      - Leptospirosis
      - <u>Brucella melitensis</u>

3. Exotic Diseases	Considerations:
- FMD	- Risk index
- VVND	- Containerized cargo
- AI	- International travel
- Rinderpest	- Example Locusts! Could easily be Rinderpest droplet virus
- Heart water, see	- Northern directional Amblyomma Project flow South America>North

The emphasis on poultry and swine is dictated by the Government of St Lucia's priority on agricultural diversification and self sufficiency. The poultry and swine sector is the most organized of the livestock industry (Co-operatives). St Lucia presently produces 90% of the pork and eggs that it consumes and provides to the tourist sector. Broiler production is expected to increase 10 fold with support and trade concessions from the Government of St. Lucia. This creates a need for monitoring of organisms involved in food borne illnesses, exotic diseases viz. VVND and AI, and the above mentioned production diseases.

The importance of eradicating *Amblyomma variegatum* cannot be overemphasized. Reproductive problems play a big role in the production of large and small ruminants. It is difficult to quantify because of a poor degree of organized large animal farming. We would like to continue the CAE programme and commence on leptospirosis, brucellosis and toxoplasmosis in sheep and goats.

The Division has recently embarked on a fact (data collection) programme for poultry and swine. The programme aims to generate from the producers, processing plant and abattoirs, information related to production parameters and management practices and disease, so as to identify and prioritize problem areas in the industry that need correcting and/or monitoring. We have been receiving help and advice from IICA on how best to structure the programme. The egg monitoring board already in operation will play a key role in enhancing the program.

National co-ordinator - Mr David Demarcque, Director of Agricultural Services

Resources

Our laboratory facilities are available. We are somewhat restricted in terms of staff, severely restricted in terms of transportation and do not have computer facilities.

RECOMMENDATIONS

General principles same as for the plant sector.

Organization	-	National level
Co-ordination	-	Regional
Computerization	-	National and regional
Accessing Reference Information	-	North American information Centres

PLANT

ORGANIZATION

The Plant Protection Unit in St. Lucia falls under the Research Division. It is headed by a Senior Crop Protection Officer who is assisted by two Crop Protection Officers, one of whom is presently on study leave. They in turn are assisted by four Crop Protection Assistants, one of whom is also on study leave at this time. The unit is assisted in plant quarantine duties by one Extension Officer in the south of the island and one Plant Propagation Farm Manager in the south-west sector. Recently, an officer graduated with a Masters degree in Plant Protection from the University of the West Indies and it is hoped that she will join the staff shortly.

LEGISLATION

The present legislation came into effect in 1942 and is greatly inadequate, but it still provides the authority to carry out plant protection duties. The new plant protection legislation is now at the bill stage before Parliament and it is hoped that it will become law by the end of the year (1988). The new legislation is based on the FAO model which has been circulated throughout the region. It provides for the formation of a Plant Protection Board which will carry out functions such as the preparation of orders or regulations, declaration of notifiable plant pests, determination of the status of plant material being offered for importation into St. Lucia and supervision of the management, operational and physical

requirements of the plant quarantine service.

INSPECTION

Field

In the field, investigation of plant pest and disease problems is mainly done as a response to reports of problems encountered by farmers, extension officers, or the public at large. This is done as soon as possible after receiving the report, and the best diagnosis possible is made using the assistance of resource personnel from CARDI, IICA and WINBAN.

In order to carry out more effective identification of pests in the field, a library is currently being established. Eventually, by knowing what exists locally, it is hoped that recognition of any new introductions will be expedited and made easier in the shortest possible time. Meanwhile situations encountered in the field are carefully noted and documented.

Ports

St. Lucia has seven ports of entry. In the north are Rodney Bay, Castries Port and Vigie airport. Marigot Bay and Soufriere harbour are in the west. Hewanoora International Airport and the Vieux-Fort docks are in the south of the island. Castries Port and Vigie airport are serviced daily by the two Crop Protection Assistants, while the other ports are serviced on notification from customs officials. Normally plant products are detained by the Customs Department until they are examined by the plant quarantine officers.

Import

To import plant material into St. Lucia a permit is required from the Plant Protection Unit. This permit is issued or denied after the pest risk has been based on available information. This will be a major function of the Plant Protection Board to be formed under the new Plant Protection legislation. Other plant material such as foodstuffs must be accompanied by a phytosanitary certificate which in certain cases must contain specific additional declarations.

Plant material which is imported into the island as part of passenger luggage may or may not be accompanied by a phytosanitary certificate. The material is detained by officers of the Customs Department when found, and is examined by a Plant Quarantine Officer as soon as possible. Entry of such material is determined on the basis of factors such as its origin, condition and the presence of pests or disease.

Export

Plant material offered for export is usually inspected by a plant quarantine officer at our head office in Castries, at our field stations in the north, south and southwest, or at the packing site before shipment. Every effort is made to ensure that the material is clean, free from soil, pests and diseases, and if necessary, treated before shipment. Also every effort is made to ensure that the plant material meets the requirements of the importing country as far as the information in hand will permit.

Public Awareness Campaign

The Agricultural Information Unit has been involved in informing the public about common vegetable and crop pests. To supplement the process of updating the plant protection legislation, the decision has been taken to initiate an intensive publicity campaign on plant quarantine, starting in April, 1989.

In the meantime, several actions have been taken We have placed posters at the ports of entry, school visits are conducted to sensitise and inform children, farmers talks and a National Plant Quarantine Course were held (participants at the latter included shippers, Port Police, Customs officials and Ministry of Agriculture personnel), newspaper articles were published and fruit fly survey posters were posted islandwide. The unfortunate locust arrival in the region has also given our public awareness a shot in the arm. Numerous pesticide safety talks and seminars were directed at all sectors of the population, but especially at farmers and at persons coming in contact with pesticides.

Problams and Constraints

From what has already been mentioned, it may be seen that there are considerable short-comings in St. Lucia's plant protection system. Staffing must be mentioned first because there is definitely not enough manpower to carry out all the plant protection activities effectively. A main need is for assistants to help service ports and to perform quarantine duties, in addition to carrying out surveys, trials and laboratory work.

A second need is adequate financing of these important activities. Thirdly, there is the problem of insufficient facilities, and fourthly, the need to train personnel. It is also necessary for the Unit to be more adequately informed about international and especially regional plant protection and quarantine matters.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN ST. VINCENT

INTRODUCTION

St. Vincent is one of the Windward Islands in the Lesser Antilles. It lies 25 miles South of St. Lucia, 100 miles West of Barbados, and 70 miles North of Grenada.

It has an area of 385 sq. km. The terrain of St. Vincent is mountainous. About 6,000 hectares have slopes up to 20 degrees. This is suitable for cultivation with varying degrees of limitation. Another 5,600 hectares with slopes ranging from 20-30 degrees is marginally suitable for cultivation because of erosion risks.

The population of St. Vincent and the Grenadines is estimated to be 111,100.

The contribution of agricultural production including livestock and fisheries to the gross domestic product ranged from 15.1 to 19 percent for the period of 1980 to 1985. The agriculture sector continues to be the largest contributor to the national income and employment in St. Vincent.

There is a very strong tradition of small holder agriculture with the implementation of the Land Reform Programme in St. Vincent.

LIVESTOCK PRODUCTION

The great majority of livestock production occurs on small holdings ranging from 0 - 10 acres. Land holdings are so small and fragmented that application of modern technology and large scale production is difficult. There is heavy pressure to use land for industrial, residential and other development. In this competition, agriculture and especially livestock has generally been accorded the more marginal area.

The demand for food of animal origin greatly exceeds the locally produced supplies and the gap is progressively widening. In 1986, the livestock products importation bill was EC$14,336,003. The percentage of livestock products to the total food import bill was 29%.

Recently the Government's emphasis has been to establish veterinary services as an integral part of livestock production. This policy has met with success in monitoring the nation's

livestock disease status and reducing preweaning, post weaning and adult mortality through delivery of clinical and advisory services to small farmers.

The livestock population is estimated as follows:

Cattle	-	6,000
Sheep	-	13,000
Goats	-	5,000
Pigs	-	6,000
Poultry	-	125,000

HEALTH STATUS

Serologic surveys have confirmed the absence of:

- Infectious bovine rhinotracheitis
- Bovine viral diarrhoea
- Rinderpest
- Peste des petits ruminants
- Bovine Herpes mammilitis

However, serologic studies have indicated widespread reactions to leptospirosis, toxoplasmosis and bluetongue. PI3 antibodies have been recorded in cattle. Poultry serum samples have been screened with negative results for Fowl typhoid, Infectious bursal disease, and Newcastle disease. However, antibodies to Mycoplasma gallisepticum have been confirmed.

Animals have been periodically tested for tuberculosis and brucellosis with negative results.

Anaplasmosis and babesiosis, Fowl pox, Fowl Cholera and Infectious Coryza occur sporadically. Mild forms of dermatophylosis occur during the rainy season. Amblyomma ticks have not been associated with this condition.

Up to October 31st, 1988 only two types of ticks - Boophilus microplus and Rhipicephalus sanguineus were found to be present. On November 1st, 1988 the presence of Amblyomma variegatum was recorded for the first time.

Antibodies to CAE were recorded in 1983. In July, 1988 serum samples were forwarded to Barbados for further investigations.

A high incidence of internal parasites occurs in livestock. Poor husbandry practices are responsible for this high incidence

of helminthiasis (Raninga 1986). Farmers are advised on beneficial management practices such as pasture rotation, optimum stocking rate and segregated grazing of young and adult livestock, aimed at reducing the level of contamination of pastures and exposure of susceptible stock.

SOURCE OF ANIMAL HEALTH INFORMATION

Animal health services in St. Vincent and the Grenadines are provided by the government. Monitoring through abattoirs is not up to the level required because of inadequate facilities, and because meat inspection is carried out by public health personnel.

Number of veterinary and auxiliary personnel providing animal health services in St. Vincent

Personnel	**No.**
Veterinarians	2
Animal Health Assistants	5

RECORDING OF ANIMAL HEALTH INFORMATION

Government veterinary staff are primarily responsible for supplying information on animal health and they keep records and report all animals that have received attention. There are now permanent laboratory facilities which also provide information on specimens submitted. However, overseas institutes such as the Central Veterinary Laboratory, Weybridge, UK; Animal Virus Research Institute, Pirbright, UK; Center for Tropical Veterinary Medicine, Edinburgh, UK; Veterinary Diagnostic Laboratory, Trinidad; and the Caribbean Regional Epidemiology Centre (PAHO) in Trinidad have assisted with serological studies.

TYPES OF SURVEILLANCE

Animal health surveillance activities in St. Vincent are based on individual herd visits to detect any foci of diseases.

Besides this, a system of delivering animal health and advisory services on a regular basis to small holders through strategically established "roadside clinic points" was introduced in 1981. The objective of the "roadside clinic points" is to conduct active surveillance in contrast to passively waiting for notification. Estimations of clinical disease, general surveys, and special investigations form important components of this

system. This system has been useful in estimating the level of disease in large populations through random sampling, and reveals spatial (geographical) and temporal (seasonal) patterns of disease.

Abattoir surveillance is occasionally carried out by professional staff of the veterinary department. However, the abattoir facilities are inadequate and there is a risk of injury. Moreover, meat inspection is under the responsibility of the Ministry of Health, and therefore operation of veterinary services in slaughterhouse is not possible at the moment.

Livestock producers have been encouraged to call upon the veterinary department for post mortem examination of animals which died suddenly or which died without examination by the veterinary department.

Legislation and supporting regulations exist to control importation of animals and animal products into the State, as well as for control or eradication of scheduled diseases, and to give authority to quarantine or destroy animals and animal products.

Importations of animals and animal products are now recorded in detail when inspection is carried out at the two designated ports of entry. Import regulations are strictly enforced. Supermarkets are checked periodically for prohibited products.

PRIORITIES

- Continue monitoring the national herd/flocks on clinical signs and upgrade this system of monitoring where necessary.

- Update information on the prevalence of zoonotic and animal diseases.

- Equip the newly acquired permanent laboratory facilities to undertake disease surveys.

- Encourage field staff to collect specimens for disease diagnosis. Information on correct diagnosis would help to build a comprehensive health information system.

- Use production losses as a parameter not only to measure the impact of disease, but also other factors.

- Education program to show the benefits of efficient livestock raising.

- Formulate a reporting system for ante and post mortem findings at the new abattoir.

- Urge the concerned authorities that meat inspection be placed under the responsibility of veterinary authority for disease monitoring as diseases recognised at abattoir also reflect the state of animal health.

- Installation of incinerator and small cold-storage facilities at the two ports of entry.

- Having confirmed copper and magnesium deficiency in cattle, it is planned to determine mineral status and develop a nutritional support system.

- Collection of accurate slaughter data from rural areas to keep close check on changes in the pattern of livestock demand.

- Determine role of viruses and other micro-organisms in neonatal diarrhoea.

- Training of auxiliary personnel is critical for supporting the surveillance programme. In the last two years, the auxiliary personnel situation has deteriorated. Two Vincentians began studies at REPAHA in 1988. Hopefully, they will be available in 1990. Two more Vincentians would hopefully begin studies in 1989.

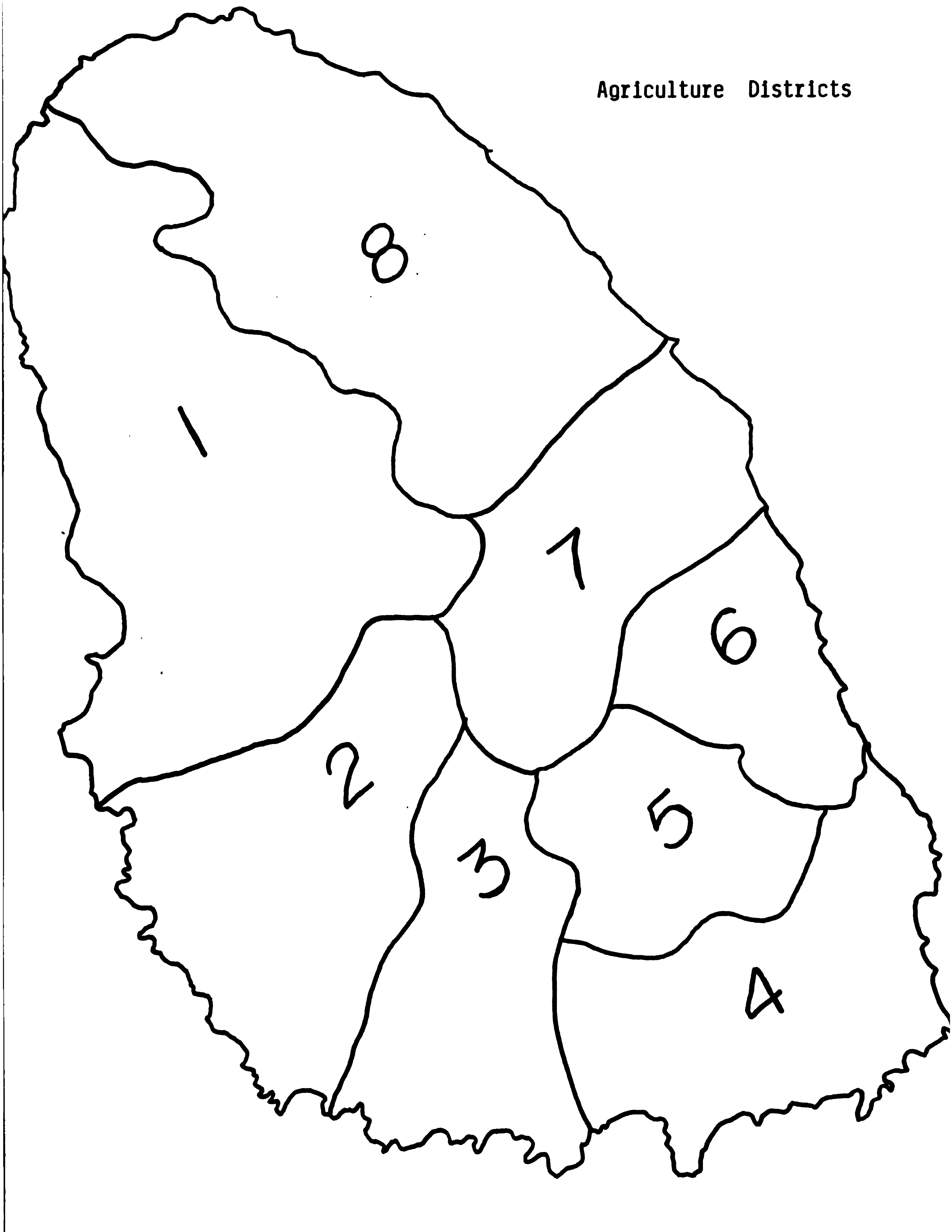
- Promotion of importance of livestock health, keeping exotic diseases out, animal production, and quarantine procedures through audio-visual programme

- Research on diseases of economic importance. It is important to look into more basic aspects of disease or production. There are many diseases of economic importance that are poorly understood and are dealt with on an empirical basis. A good example is helminthiasis. Most often "representative" faecal samples are checked and based on the results, the herd or flock may be dewormed. This practice continues year after year without due consideration to strategic and more economic use of anthelminthics. The information necessary to do this can only be obtained after a careful study of the worm burden in livestock, the larval density in pastures and taking into consideration rainfall, relative humidity, soil condition, time of the year and other parameters.

REFERENCES

Raninga, N.C. 1988. A Study of Existing Condition of Kingston Abattoir - St. Vincent and the Grenadines

Raninga, N.C. 1988. Proposals for livestock Development - St. Vincent and the Grenadines.


Agriculture Districts
8
1
7
6
2
5
3
4

1. Animal: .... Breed: .... Sex: .... Age: ....

2. Name of Owners: ....

3. Location: ....

4. District: ....

5. History: (a) Number of animals in herd/flock: ....

   (b) Number of sick animals in herd/flock: ....

   (c) Duration of illness: ....

   (d) Number of deaths in herd/flock: ....

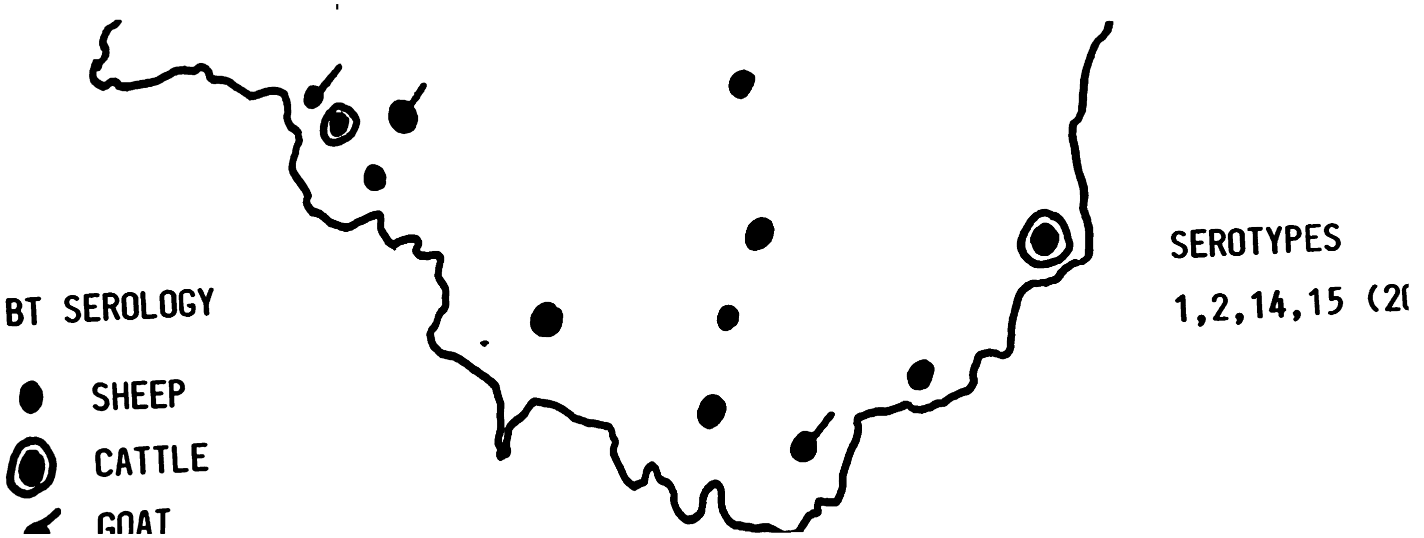
   (e) How many other herds/flock in contact: ....

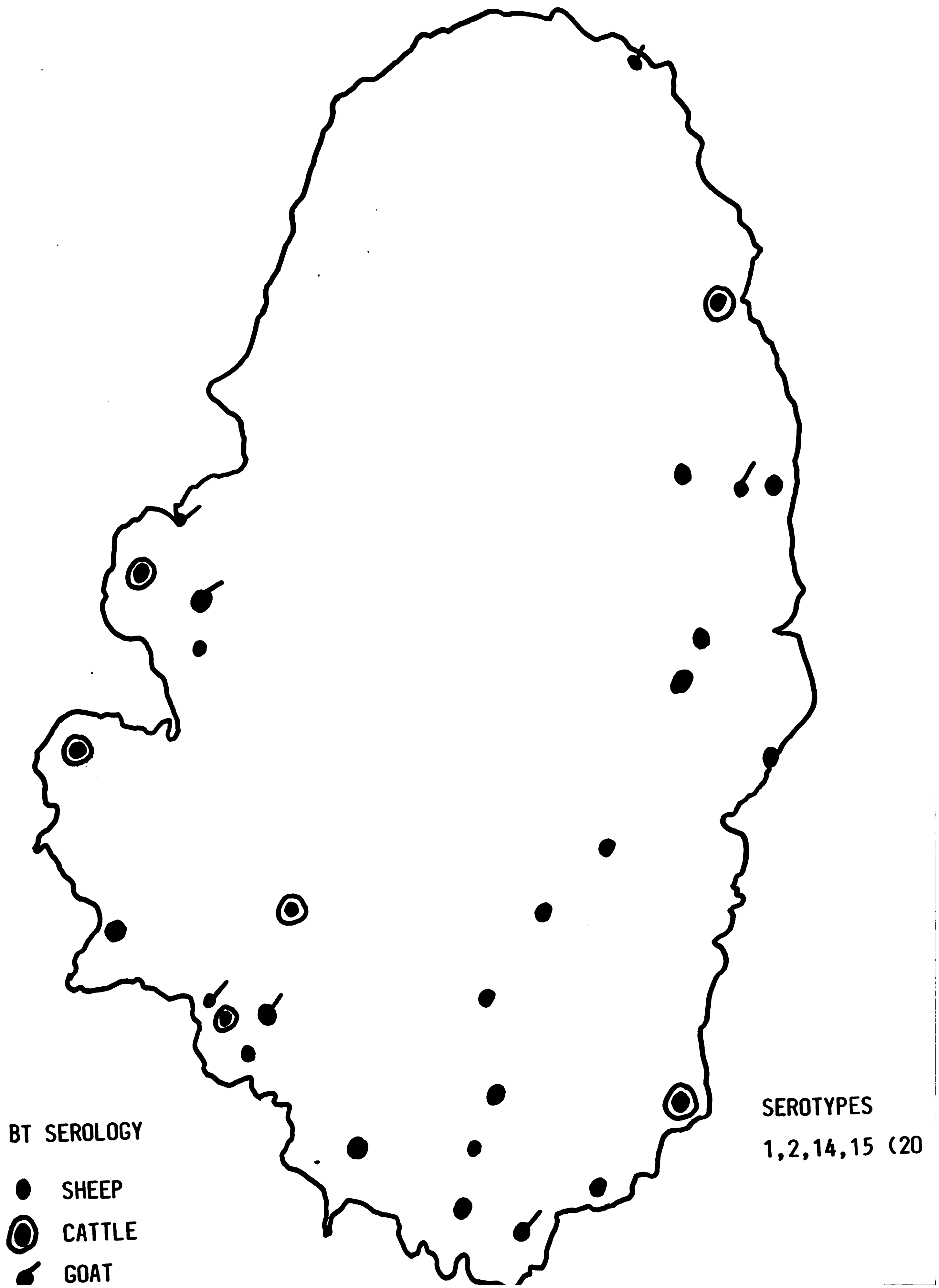
   (f) Treatment given: ....

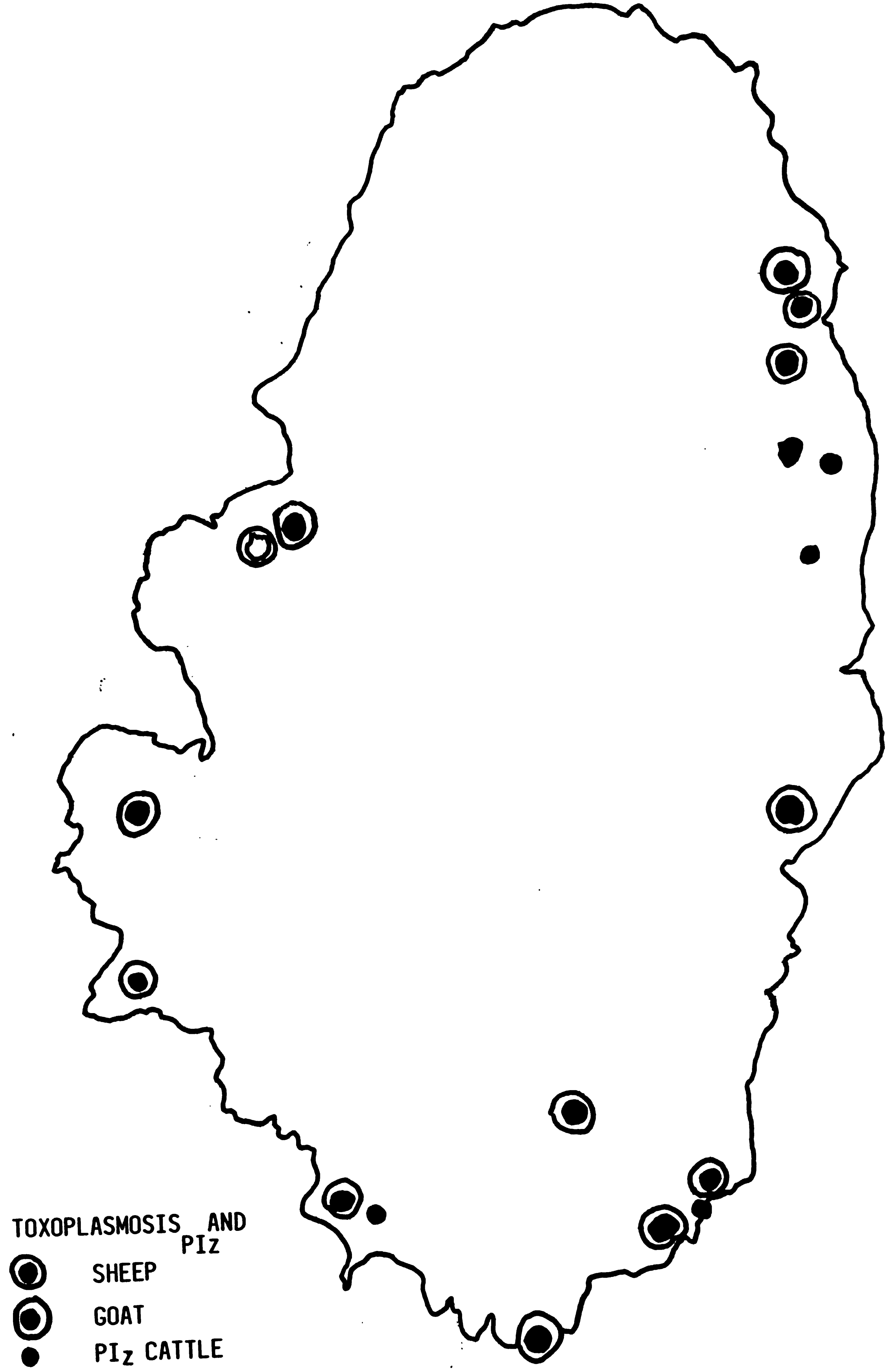
6. Clinical signs:

(a) <u>Body Condition</u>:	Good	☐	Temperature: ....C°/F°		
	Fair	☐	Difficult Breathing:		☐
			Lameness:		☐
(b) <u>Goat/Skin</u>:	Normal	☐	Parasite:		☐
	Staring	☐	Wounds:		☐
			Lumps:		☐
(c) <u>Mouth</u>:	Salivation	☐			
	Drooling	☐	Ulcers:		☐
	Normal	☐			
(d) <u>Nose</u>:	Discharge	☐	Eyes:	Watery	☐
	Frothing	☐		Opacity	☐
	Serous	☐		Pus	☐
	Pus	☐		Mucous Membrane Pale	☐
	Watery	☐		Reddish	☐

Date	Name and address of animal ow




BT SEROLOGY
SHEEP
CATTLE
GOAT
SEROTYPES
1,2,14,15 (20



TOXOPLASMOSIS AND PIz
SHEEP
GOAT
PIz CATTLE

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN ST. KITTS AND NEVIS

INTRODUCTION

As an early step in the implementation of a project approved by CARICOM's Standing Committee of Ministers responsible for Agriculture (SCMA) to improve animal health and plant protection in the Caribbean region, the Inter-American Institute for Cooperation on Agriculture (IICA) invited the Ministry of Agriculture in St. Kitts and Nevis to participate in a Workshop for Animal Health and Plant Protection Directors of the Caribbean.

The implementation of the project is expected to contribute to national goals of increased food production and trade in agricultural products by improving the information available for decision making by producers and governments. This country report identifies the related activities currently underway and lists the National priorities for pest and disease monitoring.

RELATED ACTIVITIES

There are three related activities in the area of animal health.

(i) The country is taking part in the IICA sponsored survey for Caprine Arthritis Encephalitis in the Caribbean.

(ii) There is a tick control project aimed at controlling the Tropical Bont Tick (*Amblyomma variegatum*). This activity also involves monitoring for *A. variegatum*.

(iii) Dairy cattle are tested periodically for tuberculosis and brucellosis. All results so far have been negative.

Related activities in the area of plant protection:

(i) A survey for West Indian fruit fly (*Anastrepha obliqua*) is conducted annually in a mango orchard. The aim of the study is to examine the behaviour of *A. obliqua* at different stages of the crop cycle.

(ii) A survey for mango seed weevil (Cryptorhynchus mangiferae Fab.) was conducted during June 1987 to determine the presence or absence of the mango seed weevil. The method used involved the cutting of the seed and examination of the embryo. No mango seed weevil was found during the survey.

(iii) The sugar industry annually surveys its cane fields for infestation by the West Indian cane fly (Saccharosydne saccharivora) and the moth borer (Diatraea saccharalis F.). The West Indian cane fly appears to be a new introduction while the moth borer is an old pest. The moth borer damage is generally below the economic threshold level of 5% joint infestation.

(iv) Of recent interest is the presence of the African desert locust (Schistocerca gregaria). The locust was first reported on October 13th, 1988 in the northern areas along the Atlantic coast of both islands. The locust has now been seen in all areas of the islands. A recent survey was conducted in the relatively inaccessible and uninhabited south east peninsula. Relatively high populations were observed in the northern area around a large salt pond.

NATIONAL PRIORITIES FOR PEST AND DISEASE MONITORING

Livestock

Monitoring and surveillance of:

- tuberculosis and brucellosis in cattle
- leptospirosis in cattle, swine and pigs
- internal and external parasites that affect livestock
- assessment of economic impact of Tropical Bont tick infestation and acute dermatophilosis of cattle, sheep and goats
- setting up of slaughterhouse data collection system
- veterinary diagnostic laboratory

Crops

- monitoring and surveillance of the desert locust
- assessment of the economic impact of the West Indian fruit fly
- monitoring of the West Indian cane fly and the moth borer
- surveillance for the mango seed weevil

Resources

In the area of animal disease there is at least one veterinarian and three to five animal health assistants.

For crop protection, there is an Integrated Pest Control Unit which is presently staffed by two inexperienced technicians. There are also two agronomists. The Department of Agriculture has one personal computer with a hard and a floppy disk drive.

National Project Co-ordinator

The National Project Co-ordinator has been identified as Jerome Thomas.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES

IN SURINAME

After the identification of the Dacus dorsalis fruit fly by USDA in 1985 a survey was proposed to establish its incidence and distribution in Suriname.

From conventional fruit cutting studies and additional information, it was clear that the Dacus dorsalis splice has as its major host plants the sweet carambola and Java apple (Curacao apple). No damage was done to our export fruit crops like bananas and citrus.

In view of the plant quarantine significance of this fruit fly to the region, the FAO regional officer was requested in 1986 to sponsor a technical cooperation project of US$200,000 for Suriname and Guyana to detect and eradicate the fruit fly.

As of today the project has been authorized and the agreement signed by Suriname on October 16, 1988, FAO World Food Day.

To supplement this project, Suriname, when offered technical cooperation by Brazil, agreed first by memorandum of understanding and now by a joint workplan to a US$81,000 contribution towards vehicles for this project.

With the cooperation of the IICA office in Suriname a jointly coordinated workplan has been agreed upon and hopefully will start by next December.

As a preparatory step to exchange the latest information, a fruit fly seminar was held in July 12-13, 1988. A second seminar was scheduled for March 1989 to review results of the survey. As things stand now, this will be held in July 1989 at the earliest.

It is clear that after the detection phase a decision will be made regarding eradication. Monitoring to keep Suriname free from Dacus and other fruit flies is a regional effort that Suriname will strongly support.

The structured survey for Dacus fruit flies is the major project to be identified as a national priority for monitoring and surveillance, while surveillance for Medfly, Anastrepha fruit flies and locusts are also important.

Suriname has a need for computer resources to be available for monitoring. Also required is training of personnel in pest identification and computer use.

This will enhance the output of the surveillance of this sub-regional network to be effective in January 1989.

A proposal for a permanent monitoring system was already expressed in the recommendations and conclusions of the meeting on the status of "Dacus Dorsalis Complex Species in Suriname" July 12-13, 1988 by the nations bordering Suriname.

In fact the simple provision of computer training of two persons is all that is required for Suriname. Guyana might have the same requirements. If appropriate, the workshop to consider the results of the <u>Dacus</u> survey may fall within this budget.

At this time the Plant Health Division and Animal Health Division in Suriname are two separate entities. With the network plan at hand, Suriname will, for reasons already put forward during this workshop, seriously consider integrating its Plant and Animal Quarantine services. Back-up support may be obtained from the Agricultural Experimental Station.

Allowing for a transition period this should be arrived at on short to medium term at the National level.

A regional network is an information system which the delegates of Suriname can support. The mere fact that Suriname and its neighbours are almost in execution phase of a sub-regional network on <u>Dacus</u> fruit should indicate our willingness to co-operate when the quarantine impact to the region is clear.

For the <u>Dacus</u> survey a joint workplan exists with participation of FAO, IICA, USDA, The University of Suriname and the University of Sao Paulo.

ANIMAL HEALTH

Regarding the Animal Health Sector, a project profile for a comprehensive Animal Health/Veterinary/Public Health program in Suriname was developed with the assistance of PAHO and the North Carolina State University.

Its main objective is to consolidate all animal health and veterinary public health activities into a unified and coherent National Plan.

The network plan under consideration at this workshop is seen by Suriname as a complement to the above noted project which is in the final stages of submission to an agency for complete or

partial funding.

PLANT AND ANIMAL HEALTH PROJECTS AND ACTIVITIES IN TRINIDAD AND TOBAGO

INTRODUCTION

Any involvement of the Ministry of Food Production, Marine Exploitation, Forestry and the Environment in the monitoring of plant and animal diseases and pests must be consistent with government's plans for the development of agriculture as enunciated in its draft Medium Term Macro Planning Framework and related government publications i.e. Restructuring for Economic Independence 1989-1995 and the National Agricultural Development Plan 1989 - 1995.

Cursory perusal of these documents will reveal that the crops and animals to which special attention will be paid in our thrust for economic independence are:

Crops

Rice	Passion fruit
Legumes	Cocoa
Citrus	Coffee
Sugar Cane	Ornamentals
Coconut	Papaya (Paw-paw)
Vegetables	Pineapple
Root Crops	Barbadine
Avocado	

Animals

Cattle - milk	Wildlife
- beef	Fish/Aquaculture
Sheep	Honey bee
Goats	Rabbits
Poultry including Ducks and Turkey	Pigs

Perhaps, the significant link between this workshop and the development of the project to follow it, with our government's plans for agriculture can be found in this quotation from government's Medium Term Macro Planning document:

> The extension services will therefore be upgraded and redirected to the task of disseminating critical information and advice to farmers on such matters as

pest and disease control, ... as well as monitoring production patterns".

EXISTING ACTIVITIES

The Ministry of Food Production, Marine Exploitation, Forestry and the Environment is involved in a number of activities which either impinge on, or are identical with, some of those planned for this project. These ministry activities include surveillance for a number of plant pests and disease. Studies are mainly crop oriented and priorities are consistent with the ministry's development plans referred to earlier.

The major crops and the pests/diseases under study are as follows:

Crop	Pest/Disease
Citrus	Fruit flies,
citrus	virus, nematodes
Mango	Fruit flies, anthracnose disease
Coconut	Mite (Enopleyes querreronis)
Plantain and Bananas	Nematodes
Cassava	Cassava bacterial blight
Cabbage	Caterpillars, bacterial soft rot
Peppers	Anthracnose,
bacterial	soft rot

In the case of passion fruit, rice and ornamentals, no specific study is being carried out but there is surveillance of these crops for the existence of pests and diseases of economic importance.

In addition, there are studies in pests and diseases which are not crop specific, e.g. weeds, locusts, mites and certain bacteria.

In the areas of animal health and animal production the ministry is involved in a Poultry Surveillance Programme and is about to commence on a very ambitious Herd Health cum Mastitis Programme.

The role of the Veterinary Diagnostic Laboratory is pivotal to all the animal health projects and already, the Veterinary Services Division, through the laboratory, has completed projects on salmonellosis in swine (published), brucellosis (published), leptospirosis (published), bovine enzootic leucosis, and is at present, in collaboration with the Inter-American Institute for Cooperation on Agriculture (IICA), investigating the prevalence of bluetongue and caprine arthritis encephalitis (CAE). In addition, discussions have been held with personnel at the University of Guelph, Ontario, Canada for commencement of work to determine the incidence/prevalence of Q-fever in sheep and goats.

Some attention has also been paid to zoonotic diseases in non-food producing animals, e.g. salmonellosis in dogs, gastro-intestinal ascarids (visceral larva migrans) in dogs and leptospirosis in dogs and cats.

With respect to slaughterhouse data, an important source of material for any animal disease information system will pose some difficulty because abattoirs in Trinidad and Tobago are the responsibility of the various municipal governments. In many of these abattoirs the inspection of animals and animal products is not under direct day to day veterinary supervision. In those abattoirs in which there is veterinary input, disease reporting is restricted to specific notifiable (reportable) diseases under the Animals (Disease and Importation) Act. There is, therefore, need for some collaborative effort between the Central and Municipal governments to tap this source of information.

OTHER PESTS

There are other pests which adversely affect agricultural production. These include stray dogs (affecting sheep), stray cattle (affecting vegetable crops) and stray man (praedial larceny).

The question usually posed with respect to food processing i.e. where does it actually begin - with the sorting of products at farm level or at the processing plant - could be adapted with respect to agricultural production. This latter question being, "when does agricultural production actually stop?" If you agree that production stops when you have produced a wholesome useful product - be it food, clothing or shelter - then there is a wide range of post-harvest pest and diseases which could be considered at this workshop and the project to follow. These range from bacteria and fungi, to insects, to rodents. They affect harvested fruits and vegetables, bagasse board (fungus), timber (termites) and so on.

The importance of establishing priorities and dealing with them in the context of existing resources is therefore very obvious.

PERSONNEL

The Ministry of Food Production, Marine Exploitation, Forestry and the Environment is well supplied with professionals competent in both Plant and Animal disease prevention, recognition, treatment and control. Added to these, scientists attached to certain State Enterprises, Local and Regional Institutions, e.g. Caroni Limited, the University of the West

Indies (UWI), the National Institute of Higher Education Research Science and Technology (NIHERST), etc. are available resource personnel for the national effort. To these one can without any hesitation add the Pan American Health Organization (PAHO), the Food and Agricultural Organization (FAO), the Commonwealth Institute for Biological Control and the Inter-American Institute for Cooperation on Agriculture (IICA) under whose auspices this workshop is being held.

COMPUTERIZATION

Within the Ministry there exist a number of microcomputers, some of which are in use for recording/analysing pests and diseases in plants. These are, however, inadequate for the task ahead, and while there is limited computerization of crop production records, there is as yet no computerization of pests and diseases, or of production information for animals.

It is expected that by the end of the IICA Project, a highly developed computerised system for recording, retrieving, analysing, forecasting, etc. of diseases and pests of plants and animals will be in place and will be compatible with the Ministry's plans for computerization of their other activities.

V. RAPPORTEUR'S OBSERVATIONS AND RECOMMENDATIONS OF THE WORKSHOP

Chairman: Dr. Chelston Brathwaite

OBSERVATIONS ON THE WORKSHOP

by

Wayne Martin
University of Guelph, Canada

The topic of this workshop provides a general objective for this project. Yet, as was stressed by virtually all invited speakers, the detailed objectives of the monitoring system need to be well defined before the system can be developed and implemented successfully. The speakers stressed that the information derived from the systems must be of value to solve, or prevent problems. In the current project the monitoring system needs to be manageable and must demonstrate its potential impact in a relatively short time.

In the broad context, a useful all-encompassing system would assist a) in clarifying and updating regulations/activities to prevent the importation of disease or pests, b) to document the health status of internal products/animals to assist in gaining or maintaining export markets, and c) to identify the internal diseases and pests which are limiting production or posing a public health hazard. Which of these three activities will receive major emphasis in this project is for you, the National representatives and the Advisory Committee, to decide.

What I would like to discuss briefly, in the context of the above three possible project thrusts, is what to monitor, types and sources of data, and aspects of training.

In terms of what to monitor, one can choose to monitor pests (parasites, microorganisms), diseases (at either the level of manifestations, eg. abortion, or etiologic agents - eg. CAE, Bluetongue), production (kgms of product per hectare, calves/cow/yr), or a combination of these.

Monitoring pests can provide useful information, however the invited speakers suggested that many countries were moving toward Pest Risk Assessment (PRA) which in addition to monitoring the frequency of the pest, also collected data on the natural history of the pest (especially those factors that trigger pest activity), the routes of transmission of the pest (ranked by probability of transmission if possible) and the economic effect of the pest. The latter should be based on actual data if the pest was endemic, and could be obtained by realistic estimates if the pest were exotic to a particular country.

Given limited resources, the number of pests to be monitored

might have to be limited and this would require some apriori knowledge about which pests to include or exclude. Although some pests are known to produce severe economic damage, for many pests, it is difficult to equate the prevalence and distribution of a pest with their effect.

One might choose to monitor diseases, using manifestational or, when possible, etiologic criteria. Like pest monitoring, monitoring disease fails to differentiate between disease prevalence and distribution and the actual impact of disease on production. Costs when measured, are usually only the direct costs associated with the disease and do not take into account the effects on productivity, including survivorship. On the other hand, the cost estimates fail to take into account that it also costs money to do something about the disease and fails to describe the benefits of disease control (ie. the positive side). As with pest monitoring, for selected diseases, knowing the disease is present at all may be of sufficient importance to justify expenditures on prevention/control of the disease. Certainly, for these diseases and pests, monitoring their presence in neighbouring countries or in trading partners is an essential procedure to assist in excluding these diseases/pests.

In any event, if endemic pests or diseases are to be monitored, considerable effort needs to be expended to obtain valid population at risk data. This could include the number of positive samples out of the total number examined or more details as exemplified by the NAHMS.

My bias is that, for endemic diseases, productivity should be monitored as the primary thrust of the program. I recognize that in most circumstances surrogate measures of productivity, such as the biologic level of production must be used to overcome the practical constraints of trying to get more scientifically valid measures of productivity per se. In this regard, just as this conference has brought together plant and animal health specialists, emphasizing production necessarily brings animal and plant production scientists into the circle of information gathering and sharing. Certainly, animal and plant diversification is not likely to take place, successfully, without the input of these individuals.

Monitoring production provides a benchmark of current industry/commodity achievements. Further, noting the components of production [eg. neonatal survival, growth rates, production per se (quality and quantity)], pinpoints the key areas of the production cycle including those that are, or are not, suffering a real production loss. With these data in hand, one can specifically search for the major causes of the production deficit(s). These causes might be specific pests, they might be specific diseases, they might be due to other factors such as nutrition, management, genetic limitations, etc. The causes

might even be the result of political decisions and social habits associated with the industry. In any event, monitoring production assists up-front in highlighting the problem areas and gets away from some of the post hoc discussions about why a particular program is or is not in place. It avoids erratic decisions (decisions can then be authoritative rather than authoritarian) about the importance of specific pests or diseases. It also tends to unite the product inspection services with those services directed towards disease prevention/control/eradication. Often these activities develop independently, one principally concerned with prophylaxis of human health and the other with activities directed against plant and animal diseases.

It is against this background that each country might consider establishing "National Priorities". My guess is that most countries will struggle with a mixture of exclusion/quarantine activities, monitoring/control of endemic health problems, and specific investigations of newly introduced problems. Farmers need this information to improve their production and planners need the information to use as a basis of allocating scarce resources, either for more research or for directed action, including investigations of control/eradication procedures for specific pests/diseases.

Sources of Data

If the primary objective of the system is to define the production losses in the country/region (or to define the PRA or prevalence/incidence of disease) then it is quite likely that formal random sampling methods will need to be employed. For example, selecting a random sample of dairy cow owners, goat owners, or mango producers to adequately reflect the National situation.

Other data sources may be useful if one recognizes the limitations/biases in the data. These sources include market surveys, abattoir/processor data, diagnostic lab data (often considerably biased) and field service data - the latter being either routinely collected or as a result of special investigations.

In most countries, an industry/commodity group is not a homogenous organization but rather consists of a variety of groups ranging from landless producers, to subsistence farmers, to larger commercial farms/plantations or government

demonstration farms. Hopefully, most countries will emphasize the smaller producer in agreement with CIDA's stated objectives, although work in the more technologically advanced larger farms is not prohibited.

If the primary unit of concern, for sampling, is the small land/animal owner, the data collected may have to be quite general. For example, one could collect a milk/crop sample on the day of visit for quality and quantity testing, demographic data on the animal(s)/plant/farm at that time, and possibly even some management data. At the least, one should collect sufficient data to stratify results (regardless of whether they relate to diseases, pests, or production) based on demographic factors, geographic factors and temporal factors (this may necessitate repeat visits as in longitudinal studies) for the animal or plant species/disease of concern.

Training

Training of professionals as well as technical support personnel will have to be an important component of the project. Since the project focuses on information, the training should emphasize sampling techniques, survey methods, data management, analysis, and interpretation as well as project design. The diagnostic component is essential also, but broad training in this area is probably beyond the scope of this project. Additional support should be sought for personnel training in diagnostic methods and especially in product inspection techniques (eg. plant product or slaughterhouse inspection).

The project should also emphasize training in general communication methods, particularly among countries. Ways to enhance this communication would be particularly beneficial.

In conclusion, and having been associated with large scale animal health monitoring schemes, it is important that we learn from the previous experience of others, and to place their successes, and "learning experiences" in the context of what is feasible in the Caribbean in the next few years. Certainly, if a few well-defined projects can be implemented using the available hardware and software, I have every belief that each of us will be able to demonstrate clearly that this meeting was, indeed, the start of a most useful monitoring system in this region.

RECOMMENDATIONS OF THE WORKSHOP

RECOMMENDATION I

Implement a series of model projects, each of which would address priority questions to be defined by one or more of the participating countries. Due to practical constraints it is recommended that we start with one plant-oriented and one animal-oriented topic of importance to the majority of countries of the area. These projects should be sufficiently diverse to ensure the development of a range of epidemiological skills in the region.

RECOMMENDATION II

The selection of projects should be on the basis of:

- feasibility given the resources available
- impact in terms of increased productivity, increased trade, improved protection of public health or greater protection against foreign disease entry
- effectiveness of plans for the use of the information to be generated, including its dissemination to the intended users
- soundness of design from a scientific viewpoint
- effectiveness in addressing two priority issues of the Canadian International Development Agency (CIDA), namely:

    1. providing assistance to small farmers and
    2. improving the role of women in agriculture

- breadth of interest to the region

RECOMMENDATION III

Establish a **network of plant and animal health epidemiologists** who, through a regional newsletter and regular workshops, would share information, methods and experiences in monitoring and surveillance for plant and animal diseases and pests.

RECOMMENDATION IV

Support national projects and the network through a regional centre of expertise in Agricultural epidemiology to be located in Trinidad and Tobago. The support to be provided would include:

- assistance for project design and review

- microcomputers (approx. 10-12; IBM compatible due to availability of software and support)

- Software: PANACEA[1] (an animal health and productivity data management package), word processing, and possibly spreadsheet software, and PQDBase[2] (a microcomputer database for plant quarantine applications available from FAO)

- advanced statistical analysis

- electronic mail and facsimile communications, through IICA's offices in the region. While the greatest benefit is expected to come from the improved communications within the region, these tools can also be used to speed extra-regional contacts

- training in epidemiology, data processing and project management. Training methods should include a newsletter, workshops and on-the-job training. We propose a quarterly newsletter and encourage the submission of relevant material effective immediately

RECOMMENDATION V

It is recommended that a Regional Surveillance System for pests and diseases of interest to CARICOM Member States, Haiti and Suriname be instituted. The system at its simplest would indicate the presence or absence of those pests and/or diseases and where possible indicate the prevalence and impact on the economics and/or public health importance of defined animal and/or plant diseases.

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[1]PAN Livestock Services Ltd. Department of Agriculture, University of Reading, P.O. Box 236, Reading, Berkshire, England.

[2]Announcing PQCard and PQDBase - A plant quarantine data base available from FAO. FAO Plant Protection Bulletin 35: 168, 1987.

SHORT LIST OF POSSIBLE TOPICS:

Plants:	1.	Fruit fly surveys
	2.	Desert locust surveillance
	3.	Mango seed weevil
	4.	Citrus virus indexing
Animal:	1.	Factors constraining milk production
	2.	Factors constraining production of meat from small livestock
	3.	Tuberculosis/Brucellosis/Leptospirosis
	4.	Slaughterhouse surveillance

MEMBERS OF THE ADVISORY COMMITTEE FOR PROJECT SELECTION

Trinidad and Tobago	-	Dr. Vincent Moe
Jamaica	-	Dr. David Ellis
Barbados	-	Dr. Eslie Alleyne
OECS	-	Dr. Joseph Robinson
Guyana	-	Dr. Lennox Applewhaite
Suriname	-	Dr. Robert Lieuw-a-Joe