

No.

REPORT ON ANIMAL HEALTH IMPROVEMENT
PROJECT / ATA-133
REGION - I & III

JAPAN INTERNATIONAL COOPERATION AGENCY

JUNE - 1982

INDONESIA - JAPAN TECHNICAL COOPERATION PROJECT

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PREFACE

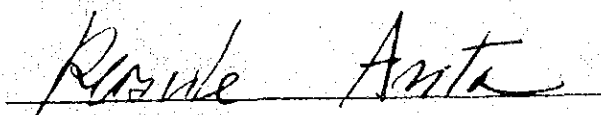
It is with great pleasure that I present to the Government of the Republic of Indonesia a report entitled the Animal Health Improvement Project in Indonesia (ATA-133).

This report embodies the result of the activities carried out at the Disease Investigation Centres in Medan and Tanjungkarang in Sumatra Island, jointly by the Japanese experts and Indonesian counterparts during the five-year period from July 7, 1977 to July 6, 1982 on the basis of the Record of Discussion signed on July 7, 1977.

I sincerely hope that this report will be useful as a reference for strengthening DIC's activities and contribute to the development of livestock industry in Indonesia.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the Japanese experts.

Tokyo, December 1982



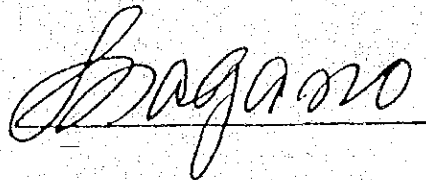
Keisuke Arita
President
Japan International Cooperation Agency

REPORT ON ANIMAL HEALTH IMPROVEMENT PROJECT

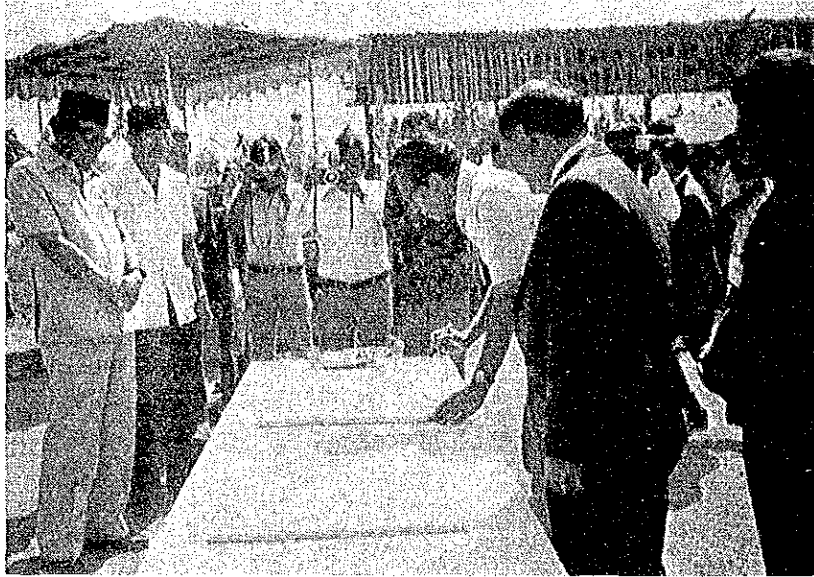
On behalf of the Japanese experts assigned to the project, I the undersigned have the honor of submitting herewith the Report on Animal Health Improvement Project for 1977 to 1982.

The activities of the project were executed under the Technical Cooperation Project on Animal Health Improvement Programme (ATA - 133) with the full collaboration of the Indonesian officials concerned.

Medan, 30 June 1982

A handwritten signature in cursive script, appearing to read 'Seichi Nagano', written over a horizontal line.

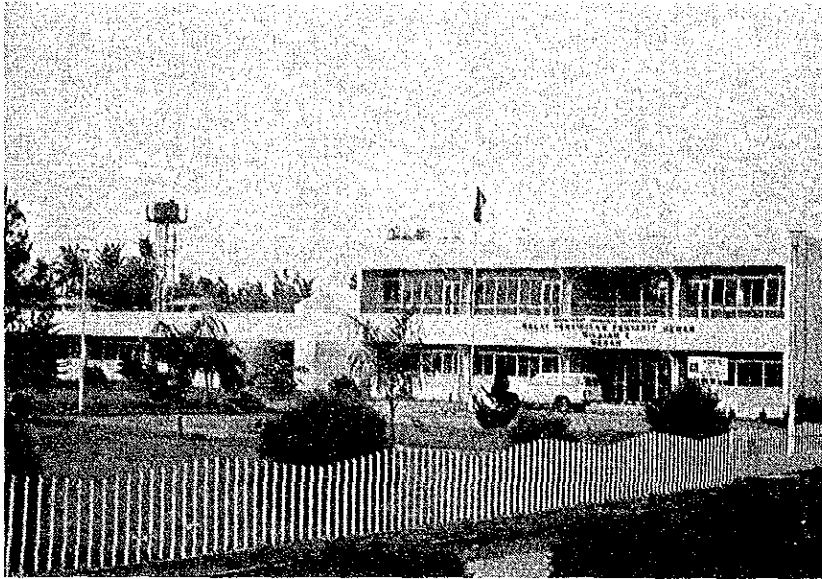
Seichi Nagano
Team Leader of JICA Experts



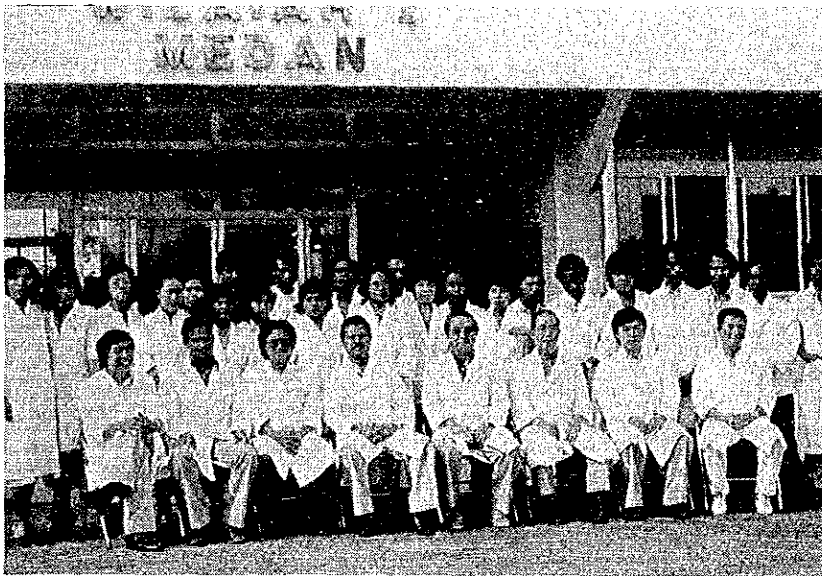
Opening ceremony of the Medan DIC
(25 November, 1978)



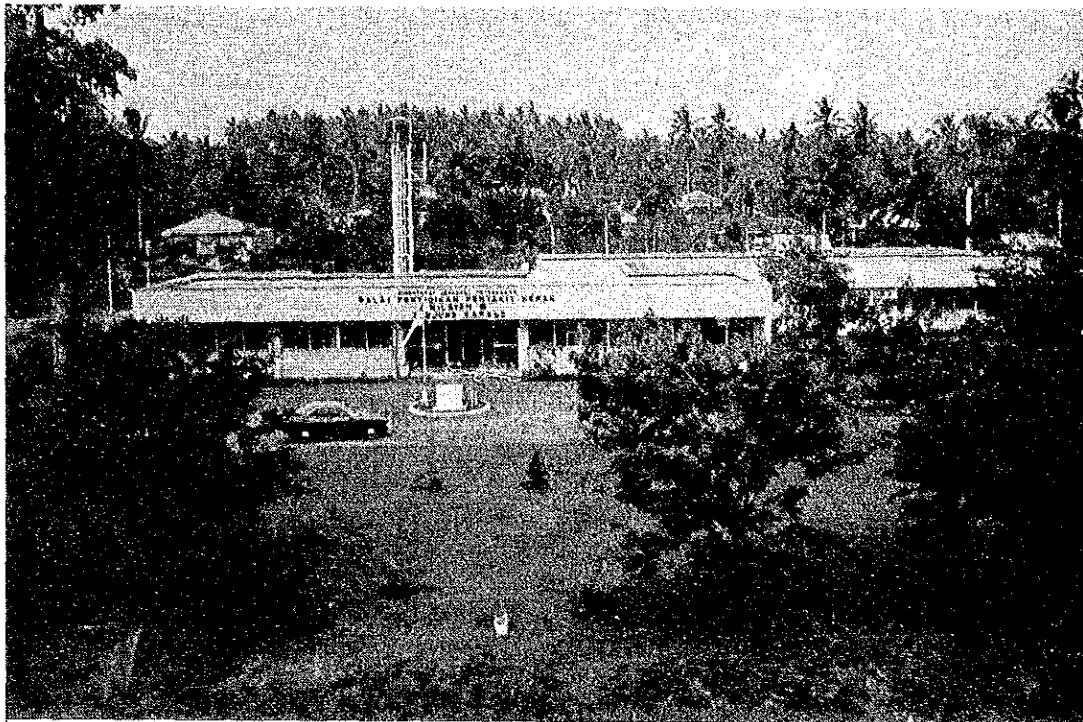
Closing ceremony of the Technical Cooperation Project
on Animal Health Improvement Programme.
(From right) Director, Dr. Adat Paranginangin, Consul-
general of Japan. Mr. Masuda, Director General of
Livestock Services Prof. Dr. J. H. Hutasoit, and
Governor of the North Sumatra Province.



The Disease Investigation Center in Medan
(front view)



Indonesian staffs and Japanese experts of the Disease
Investigation Center in Medan.



The Disease Investigation Center in Tanjungkarang (front view)



Indonesian staffs and Japanese experts of the Disease Investigation Center in Tanjungkarang

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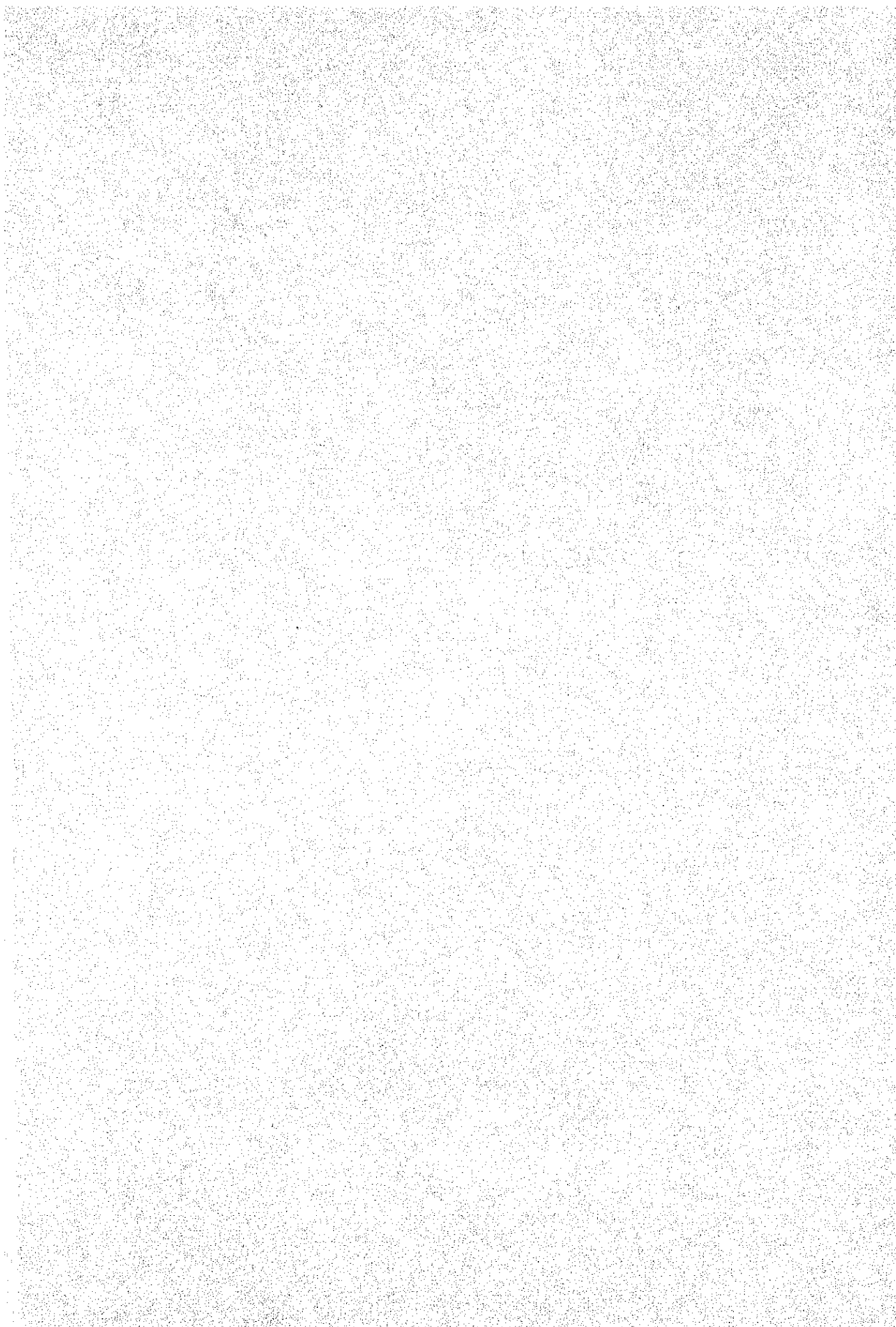
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PART - I

REGION - I

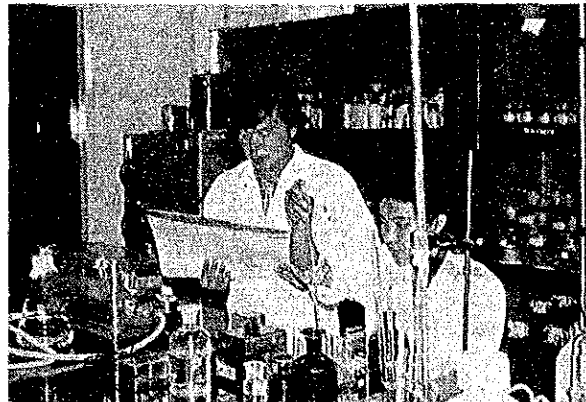
ACEH AND NORTH SUMATRA

DISEASE INVESTIGATION CENTER, MEDAN

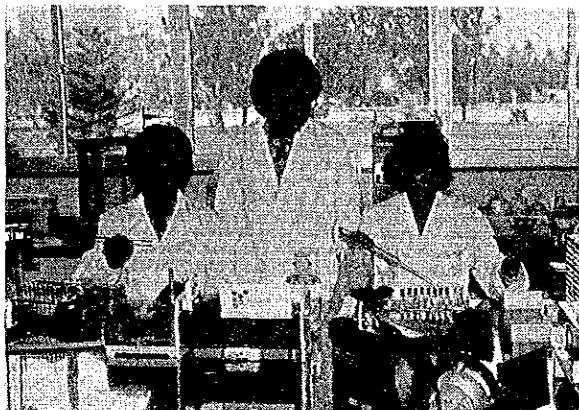




Pathological autopsy of chicken



Clinical biochemistry examination



Bacteriological examination



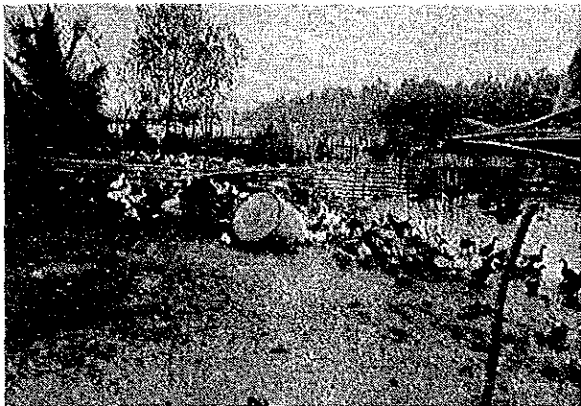
Bacteriological examination



Viological examination



Parasitological examination



Duck farm



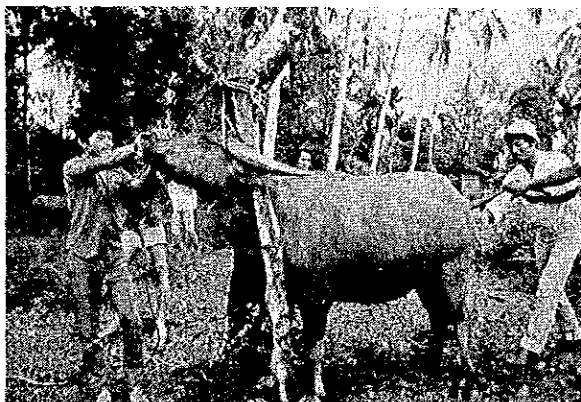
Buffalos grazing in a mountaneous region



Pullorum inspection



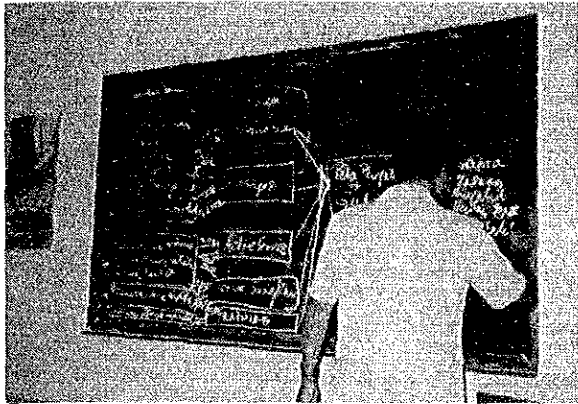
Health inspection of a goat.



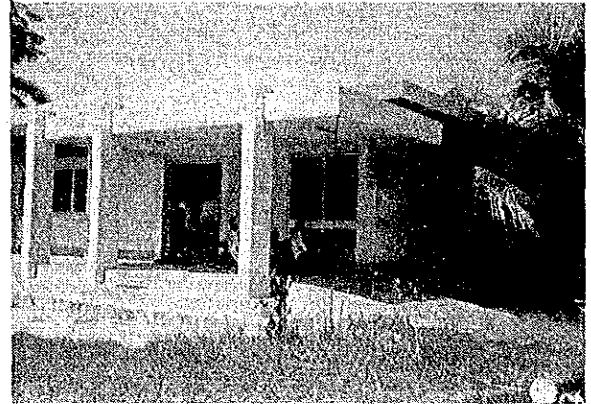
Collection of fecal specimen with securing a buffolo.



Quarantine of imported cattle



Dr. Adat, Director, going lecture in the training course.



B-type DIC, Aceh Province



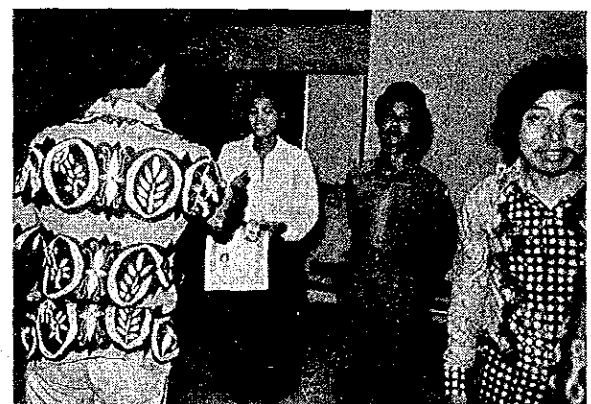
Practice of ND-HI test in the training course.



Demonstration of chicken autopsy in the training course.



Practice of chicken autopsy in the training course.



Completion ceremony for trainer.

Report on the Activities of the Animal Disease
Investigation Center, Region I, during the Period under
Record of Discussion of ATA - 133

by

Seichi Nagano, Uukio Oshio and Ikuo Koike
(JICA Colombo Plan Experts assigned at the D.I.C., Region I)

Medan

June 1982

I. Introduction

The Technical Cooperation Project on Animal Health Improvement Programme based on the Record of Discussions (R/D) concluded between the Governments of Japan and Indonesia on July 7, 1977 has been successfully implemented and will come to its termination on July 6, 1982.

The island of Sumatra has high potential for livestock development, and animal health improvement is important. Therefor the Disease Investigation Center (D.I.C.) has been plaing an important role during the past 5 years as is evident from the large number (599) of applications from farms and individuals in the case of rabies diagnosis and animals (1,641 head) submitted for diagnostic services, April 1977 - March 1978. In 1981, these numbers were 2,087 and 48,950, or about 3.5 times and 30 times respectively as many as these in 1977. The field of surveys on animal diseases and active services carried out to support animal disease control in the areas covered have developed remarkably.

In the initial stages, D.I.C. activities were limited mostly to rendering diagnostic services upon request, but they have gradually shifted to coping with animal diseases. D.I.C. services have come to the widely recognized by those holding animals

While, in the field of technical transfer, it may be said that the virus section has been lagging behind the advances made by other sections, for its poor notion of disinfection.

Planning necessary for the promotion of effective services and administrative guidance concerned with statistic management should be regarded as very important subjects in the future. The project area to be covered is so vast that the ability of D.I.C. to cope with it is, as a matter of course, limited. From now on, it will be essential to strengthen

the center of B and C types in the area and improve the network of animal health organizations. D.I.C. activities grow in collaboration with other organs concerned.

II. Summary of Activities of the D.I.C., Medan in 1977 - 1981.

1. General

The Project to Technical Cooperation in Animal Health Improvement was initiated on July 7, 1977 when the Record of Discussions on the project was signed. However, prior to its inauguration, 2 experts were sent to Medan for 6 months for preliminary investigation into enzootic diseases, etc. In the implementation stage of the project, 3 experts were dispatched to Medan in October 1977 and commenced diagnostic services at the existing laboratory, the predecessor to the present D.I.C. The construction of the D.I.C.'s building (site: JIN. Binjai km 7) which started forward the end of 1977, was completed in October 1978 and the D.I.C. was officially opened on November 25, 1978. During the following five years 9. survey and guidance teams were dispatched by JICA (Japan International Cooperation Agency) involving 6 long-term and 6 short-term experts. The training of Indonesian counterparts 6 veterinarians at the Medan D.I.C. has been conducted in Japan.

2. Diagnostic Services

During the 5 years, the total number of animals submitted for diagnostic services amounted to 80,142 head applied from 6,648 farmers. The numbers of animals and the applications involved (1977:100) for 1978 were 124 and 116 respectively, for 1979 being 1,101 and 208, for 1980 being 576 and 338, and for 1981, 2,983 and 348, or about 3.5 and 30 times as many as those in 1977. A remarkable increase is found in the number of animals per one application.

In terms of the percentage of animals submitted for diagnostic services during the 5 years, fowl were the most numerous accounting for 79.9%, cattle 11.4%, buffalo 3.2%, dogs 2.6%, and swine 1.9%. However, dogs accounted for the highest 33.5% of the total number of applications, indicating that diagnostic services for rabies claim an important position in the D.I.C. In terms of applications for other animals, cattle accounted for 24.3%, buffalo 16.7%, fowl 13.9%, and swine 5.4%.

Of the specimens, blood specimens accounted for 80.5%, blood smears 7.5%, fecal specimens 5.0%, whole bodies (alive or dead) 2.4%,

brains 1.8%, the other internal organs 1.2%, and others 1.0%. Blood specimens accounted for the majority cases because the eradication of pullorum disease at breeders has been carried out and field investigations of enzootic diseases in cattle, buffalo, and swine have been conducted since 1979. The D.I.C. activity has shifted from passive diagnostic services to positive action in the latter half of the project term.

As for diagnostic services, 28 kinds of diseases have been diagnosed as belonging to cattle, 21 kinds to buffalo, 2 kinds to horses, 12 kinds to sheep, 9 kinds to goats, 14 kinds to swine, 23 kinds to fowl, one kind each to dogs and cats, monkeys, and 5 other kinds to other animals. The total amounted to 117, and regarding the causative organism, 57 kinds have been found.

Important diseases include hemorrhagic septicemia and surra in cattle and buffalo, pasteurellosis and strongyloidiasis in swine, Newcastle disease and fowl cholera in fowl, and rabies in dogs. Relationships between these diseases and seasonal conditions have been epidemiologically verified to some extent, that is, hemorrhagic septicemia has been found rather frequently around September when the rainy season sets in, and the occurrence of rabies was found to increase also in September, October and frequently in rainy January, February and March when the dry season sets in. A similar trend was also found in the occurring of Newcastle disease and coccidiosis. Furthermore, geographical distribution of important diseases has also been gradually clarified (refer to maps), and comprehensive counter-measures to the respective diseases are expected to be taken by Indonesia. Various diseases in respective animals are listed in the reference tables..

As regards microbes and parasites isolated and identified in the examination sections of the D.I.C., 3 kinds of viruses were detected from 1977 to 1982, 37 kinds of bacteria from 1977 to 1978, 32 in 1979, 29 (including 2 kinds of fungi) in 1980, 49 in 1981, and 8 kinds of protozoa, 4 of trematoda and 12 of arthropod respectively from 1977 to 1982.

3. Diseases of Major Importance in the Area Covered

1) Hemorrhagic Septicemia of Cattle and Buffalo

(1) Occurrence

A big outbreak occurred in the Aceh Barat (West Aceh) district in June to August, 1977 which resulted in the biggest economic loss in the recent history of both provinces with the death of several thousand head of buffalo and cattle.

Also, occurrences were found in 8 districts and 2 administrative cities of North Sumatra Province in 1977. In 1979 and 1980, there was no occurrence of the disease in North Sumatra Province, but an outbreak was found in buffalo being raised in the mountainous regions of the province in March, 1981, and also in one herd of dairy cattle in the district contiguous to Medan in May, 1981. Furthermore, it occurred in buffalo employed for draft and cultivation work in Samosir island of the Toba Lake in the same year. The outbreaks resulted in death of several cattle and buffalo but less than 20 in both cases. During the 5 years, outbreaks were found to occur comparatively frequently in September when the rainy season sets in. This trend should be taken into consideration for vaccination timing. The occurrences in buffalo have been found more frequently than in cattle. The buffalo can be considered to be easily infected through water.

(2) Clinical symptoms and autopsy findings

As main clinical symptoms, anorexia, edema in the larynx, and attacks of fever (40 - 41°C) have been reported from provincial local staff. They have reported that the disease never occurs without edema in the larynx. Therefore, they have regarded the edema as an important symptom for prompt diagnosis of the disease. In the development of this symptom, it has been reported that accelerated respiration and its distress is observed and that infected animals are likely to die in one to 3 days.

In the autopsy findings, it has been reported that widespread patchiae are observed mainly in the subcutaneous tissue, peritoneum, mesentery, intestinal serosa and mucosa, pleura, pericardium, and exposed mucosae, and pneumonia findings have also been occasionally reported.

(3) Prevention and treatment

The corresponding vaccines are being produced at a national institute for animal vaccine products, and the inactivated vaccine of which bacteria (*Pasteurella multocida*) serologically belong to B type has been available in mixture with an oil adjuvant. According to the statistical data of the livestock bureau of North Sumatra Province in 1980, the population of cattle and buffalo was about 315,000, but the total number vaccinated was about 80,000 of the population, with the vaccination rate accounting for about 25%. (P.T.O.)

Regarding treatment, it has been reported that administration of the specific antisera and one of antibiotics (teramycin, penicillin, streptomycin, etc.) was effective when animals were found at the incipient stage of the disease.

2) Infectious Bovine Rhinotrachitis (IBR) in Buffalo

(1) Occurrence

The occurrence of an unknown disease causing eye troubles (conjunctivitis as a major sign) and respiratory symptoms in buffalo has been found every year in some paddy regions in D. Serdang district, North Sumatra Province, since October, 1978, prevailing for about one month around May and October.

Main symptoms are respiratory ones and eye troubles are also observed, that is, anorexia, serous nasal discharge, attack of fever, accelerated respiration, cough, tears, conjunctivitis and so on. Streptococcus sp, Staphylococcus sp, Escherihia coli, Flavobacterium sp, Shigella sp, and so on have been isolated from eye excretions and nasal discharge. The causative organism of major importance was not detected until 1981, but with advancement of techniques in virology,

the important cause has been understood. In the 1981 outbreak not only respiratory symptoms but also vulvovaginitis was observed and a virus was isolated from nasal discharge and identified as IBR virus by F.A.T. and positive reactors to neutralization tests with serum specimens were detected from several herds in which the disease was found to be prevailing.

(2) Autopsy findings

Autopsy findings as follows have been observed.

- a. Formation of small granulus and tunic of yellow-gray in color in the conjuction
- b. Inflammation in the nasal mucosa, edema in the pharynx, swelling in lymph nodes of the pharynx and the upper site of the bronchi
- c. Edema or inflammation in the lung

(3) Prevention and treatment

Vaccination against IBR is not yet available in Indonesia but the administration of antibiotics (penicillin, teramycin, erythromycin, etc.) has resulted in remarkable effects.

It is expected that a survery should be implemented on the actual state of this disease in other areas in the future.

3) Surra Disease

(1) Occurrence

After inspections of blood smears collected from the area covered during the past 5 years, Trypanosoma evansi was detected in 15 head of cattle, 32 in buffalo and 3 in horses. Generally, the parasitic condition has been found light in the majority of blood smear specimens inspected, that is, only one or 2 Trypanosoma being observed in one blood smear in many cases. In a few samples only, 3 - 4 could be observed in one visual field of a microscope.

(2) Countermeasure

Nagano1 and Trypamidium have been made available for treatment and have produced good results. However, there have been no countermeasures taken against vectors. Hereafter, it is necessary to take strategies of using dust bags and insecticides.

4) Ascariasis in Buffalo

(1) Occurrence

In 1982, an investigation into Ascariasis in young buffalo was carried out in various districts, and in North Sumatra Province, where young buffalo seem to suffer heavily from Ascariasis. The subject of investigation was young buffalo of less than 6 months, and it was revealed that there was rarely any buffalo suffering heavily with E.P.G., about 66,000, and such buffalo had rough fur and were underdeveloped. The ratio of Ascaris parasitism was about 17.5% in young buffalo inspected.

(2) Countermeasure

Administration of Piperazine drug has been available for driving away Accaris and has produced some effect. But, careful consideration should be given to the timing of driving away the parasite and so on. It is necessary to give guidance in periodical driving away Ascaris in the case of young buffalo, particularly for buffalo of less than 3 months.

5) Hypobosca Parasitism

(1) Occurrence

At the request of the Ministry of Agriculture of Indonesia in July, a survey on the actual state of Hypobosca parasitism in cattle in Aceh Province was carried out in order to investigate its ecology and to plan epidemiological countermeasures. At the field inspection, a lot of parasitic Hypoboscae were found on the body surface of cattle inspected in some areas and seemed to cause a bad influence on the cattle's health. As a result of investigation, it was revealed that Hypobosca is not a native insect in Aceh

Province and seemed to be brought in with cattle introduced from other regions and since propagated.

It has been reported that parasitic Hypobosca have been found on cattle being raised in Timor island, and an investigation was carried out on cattle introduced from Timor island in the 4 districts, of Aceh Besar, Aceh Pidie, Aceh Utara, and Aceh Timur. As a result, Hypobosca parasitism was found only within Aceh Besar and there was no parasites found on cattle in other districts in that investigation.

(2) Countermeasure

In the 1980 occurrence, a 0.03% solution of Asuntol was sprayed on the cattle once every month to try to exterminate Hypobosca. As the result of the follow-up program carried out in 1981, the infected area was quarantined and the number of parasitic Hypobosca on the cattle was found to have decreased in comparison with the previous year. However, the parasite is still being observed, and the spraying of Negvon on cattle by the dust bag method was recommended together with that of Asuntol.

Indonesia consists of numerous islands and it is not rare that one disease can prevail on some island, but not on other islands. Therefore, animal quarantine between islands should be more strict so that cases such as Hypobosca in Aceh Province can be prevented.

6) Argas Parasitism

(1) Occurrence

In August of 1981, Argas sp. was observed in specimens brought from one fowl farm located in Aceh Besar. The parasite was identified as Argas robertsi by the observation of hatching ticks. Chickens are likely to suffer from Argas robertsi's bloodsuck and die. The chicks of the farm, of age 7 to 10 days, were likely to die and mortality amounted to 70 - 80%.

As an indirect influence, the tick is regarded as a vector of Spirochaeta and Piroplasma for the fowl, so countermeasures are important.

(2) Countermeasure

For extermination of the tick, jute bags have been hung to attract the adults and nymphs into them during the day and then burned. But, this method is not successful for the extermination of the larva so to solve this problem, it is necessary to spray insecticide onto the fowl. Since Argas has spread to a few farms contiguous to the farm where the parasite was first observed, it is currently important to restrict the fowls' contact between farms and to implement a periodic inspection for extermination.

7) Rabies

(1) Occurrence

Dogs have accounted for the majority of positive diagnoses in rabies over the past 5 years from April 1977 to March 1982. Cats, monkeys, and swine accounted for the other animals, in this order.

As regards the occurrences in respective animals, the positive ratio of rabies diagnose amounted to about 68.4% (number of positive head/number of head submitted to diagnostic services, 1,527/2,234) for dogs, 49.4% (42/85) for cats, 31.6% (6/19) for monkeys, and 100% (1/1) for swine.

All of the animals submitted to diagnostic services had done with men having been bitten. Therefore, the aspect in the natural world of the area covered remains entirely unknown.

In view of the trend of the positive ratio over the 5 years, that in 1978 accounted for about 40.6%, but in others for about 67.5% to 75.9%.

Occurrences in North Sumatra Province accounted for more than 90%, and ones in Aceh Province for less than 10%. One of the causes is that the population of dogs in Aceh Province is much smaller than in North Sumatra Province. In respect to the spatial distribution of rabies in North Sumatra Province, the disease events during the 5 years accounted for about 40 to 45% of those in Medan except for about 36% in

1978. And the total of the occurrences in Medan and its neighboring districts and small or medium cities accounted for more than 80%. Occurrences were found in 8 districts in North Sumatra Province and in 5 in Aceh Province.

(2) Diagnosis

The methods used for diagnosis were as follows.

- a. Consideration of clinical symptoms
- b. Observation of Negri body in stamp smears stained by Seller's method and that of nonpurulent encephalitis
- c. FAT

(3) Countermeasures for prevention

The countermeasures to be remarked upon are as follows.

- a. Capture of homeless dogs in the urban areas and their outskirts
- b. To impose the responsibility for dogs' vaccination against rabies upon the owners
- c. To secure the required amount of vaccine for the above aims
- d. Development of a vaccine available for long periods and assay of vaccines, both domestic and foreign

8) Brucellosis in Cattle and Buffalo

(1) Occurrence

In 1979, one dairy farm located in the suburb of Medan experienced a so-called "abortion storm". In laboratory examinations, strong positive reactors to the Brucella serological test were detected in the herd. While positively reacting cattle were found in several districts of North Sumatra Province through several field investigations and in Aceh Province also, the positively reacting cattle and buffalo were found to be distributed in all districts but one. The causative microbe remains to be isolated. On the other hand there were 5 cattle diagnosed as positive reactors amongst imported cattle (the total number, 2,877) into both provinces from Australia during a one year period from

February 1981 to January 1982, and these cattle were subsequently slaughtered.

As the result of intensive investigations apart from the other field surveys into brucellosis in cattle and buffalo, 17 positive reactors amongst 221 local cattle inspected were detected but none amongst 140 buffalo in North Sumatra Provinces; however, in Aceh Province 18 amongst 262 local cattle were detected and 6 amongst 154 buffalo.

(2) Countermeasure

While positive reactors detected in cattle imported at quarantine have been slaughtered, it has been rarely done for local cattle and buffalo in spite of positive reactions because they are employed for draft and cultivation work as important labour in agriculture. A two-herd plan has been recommended for dairy farms. ms.

9) Babesiosis

(1) Occurrence

The detection ratio of Babesia in the blood smears of inspected cattle and buffalo accounted for about 1.8% over the 5 years. Majority of the Babesia have been regarded as Babesia bigemina, and in a few samples Theileria sp was observed. However, there have been a few cases of cattle or buffalo which seemd to have died of babesiosis.

(2) Countermeasure

Akaprine has been used for treatment with good effect, but extermination of ticks has rarely been possible.

10) Haemonchosis in Ruminants

(1) Occurrence

Haemonchus is found to be frequently parasitic on ruminants of cattle, buffalo, sheep and goats as compared with other gastrointestinal worms of ruminants. This parasitism has been a problem for the grazing hygiene of sheep and goats in various parts of the world. In laboratory examinations, Haemonchus has been frequently detected in cattle and

buffalo, too. The ratio of the parasites' being parasitic accounted for about 15% in cattle and about 3% in buffalo, while being for about 48% for sheep and goats.

(2) Countermeasure

Papentazol and Nemavax are available for driving away Haemonchus.

11) Newcastle Disease (ND)

(1) Occurrence

Diagnoses of ND were determined in 113 applications and 421 fowls submitted to diagnostic services and stood 3rd in the number of diagnoses made in poultry diseases during the 5 years of April 1977 to March 1982, accounting for about 17%.

This disease seems to be found in most of North Sumatra Province. Most applications have come from Medan, its outskirts and neighbouring districts where the poultry industry is flourishing.

Greenish diarrhea feces, paralysis in the legs and other nervous symptoms have been observed.

In autopsy findings, hemorrhagics have been frequently found in the site of gastrointestinal.

The diagnosis has been made with consideration of clinical symptoms, epidemiological points, results of autopsy, embryonic egg inoculation, HA test of harvested virus, HI test of serum samples and FAT.

The mortality in the population has been mostly found to amount to about 30 to 50%.

(2) Countermeasure

a. Thorough guidance of proper vaccination programme to farmers

b. Assay of vaccines, both domestic and foreign

12) Pullorum Disease

(1) Occurrence

Positive reactors to the agglutination test have been most frequently detected in diagnostic services up to today and found in 900 fowls from 81 applications.

From the spatial distribution which has become known by a field survey in North Sumatra Province, we know that it has spread in the layer farms not only around Medan but also into relatively distant districts from Medan.

(2) Countermeasure

There are several breeders located around Medan. Most fowls have been provided to poultry farms by these breeders (partly from Java island). It is important to conduct pullorum inspections periodically at the breeders.

13) Coccidiosis in Fowl

(1) Occurrence

Coccidium was observed in 275 fowls from 84 applications during the 5 years and accounted for about 8% in autopsy inspection. Some fowls suffered greatly from Coccidium.

(2) Countermeasure

Many poultry farms have been administering Tricoxin and Noxal, sulfa drugs, mixed in with feed for prevention and control.

14) Leucocytozoonosis

(1) Occurrence

As a result of investigations into the actual state of Leucocytozoonosis of fowl at poultry farms located in several districts of North Sumatra Province, Leucocytozoon was found to be parasitic on fowl in various districts inspected, and the detection rate in blood smears amounted to about 52.1% on the average.

(2) Countermeasure

Administration of Sulfauinoxaline for one month has been adopted as a prevention method.

The D.I.C. has conducted a prevention test with Daimeton.

15) Unknown Diseases in Ducks

(1) Occurrence

In 1979, there was an outbreak of a disease found in duck farms located along the river of one district in North Sumatra Province. The mortality rate amounted to about 50% for young ducks in some farms and about 10% in others.

Though pathogenic Escherihia (O:86a, K:61) was isolated in one case, the main cause of the disease remains unknown.

There were a few common symptoms found of anorexia and nervous ones in the sick ducks.

(2) Countermeasure

Cleaning of the farm and spraying of disinfectants (Pakoma) have produced some effects.

4. Field Activity

There are 2 major types of field activities for the survey of important diseases and inspection. One is the planning type designed by the D.I.C. and another is requested by local organs of the provincial livestock bureau and holders of animals. The main field activities conducted up to today are as follows.

- 1) Investigation into the actual state of animal health in the local regions of both provinces
- 2) Animal health inspection
- 3) Animal quarantine services and the through checking of imported cattle
- 4) Investigation into bovine Brucellosis
- 5) Investigation into ectoparasites and endoparasites
- 6) Support of animal disease control by means of the necessary guidance
- 7) Investigation into poultry and swine diseases

- 8) Collection of information about animal health
- 9) Guidance of animal disease control and prevention, and its dissemination with instruction

As regards the achievements of field activities conducted during the 5 years, the number of investigations amounted to 150, and 570 days were occupied for that with the total labour required amounting to 2,099 man/day, villages inspected numbering 803, farms 2,574, and the number of animals inspected 88,666. A remarkable increase has been found in the growth per year, and it may be inferred that the D.I.C. has been carrying out positive field activities. In view of the kinds of animals inspected as the main object, the number of investigations on cattle amounted to 58, that on fowl to 52 that on buffalo to 38, that on swine to 28, that on sheep and goats to 18, and that on others to 5.

5. Technical Transfer and Training

Technical transfer, which may be one of the most important things in the project, and items of technical guidance conducted in the respective fields, are enumerated in the reference data.

Technical training courses set for provincial livestock and veterinary officers mainly engaged at B type animal health laboratories have been held periodically for the purposes of disseminating techniques necessary for animal health.

III. Recommendations

1. The number of veterinarians including the director of the D.I.C. at Medan was 4 as of 1 June 1982, with vacancies in the pathology and biochemical sections. Two counterparts for each of the important bacteriology and virology sections should be assigned, as requested, and it is required to recruit members without delay for the smooth operation of services.
2. Maintenance of the buildings, vehicles and equipment for laboratory work should be pursued in order to constantly perfect the system for standing long term use.
3. A telecommunication facility is indispensable for the smooth operation of services. In spite of repeated requests on the occasion of Joint Committee and so on, it is to be regretted that the facility has not been available during the term described in the Record of Discussions.
4. Close collaboration with provincial livestock bureaus and the organizations concerned in both provinces, and effective services should be promoted. On the other hand, it is necessary for the promotion of animal health countermeasures to strengthen the facilities, mobilize the staffs of B and C types and to make the network of the animal health organizations more substantial.
5. The introduction of research work should also be considered for the purposes of technical advancement of the staff to come.

IV. Lists of tables and figures

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6. Result of diagnostic services - Horses -
7. Result of diagnostic services - Sheep -
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1. Percentage of respective applications of various animals submitted to diagnostic services over the five years
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Table 1. Number of applications and the animals submitted to diagnostic services over the five years

The Year	Item	Cattle	Buffalo	Horses	Sheep	Goats	Swine	Chickens	Dogs	Cats	Monkeys	Others	Total
1977	Numbers/Applications	423/78	240/63	-	23/2	6/3	90/35	567/126	277/277	9/9	4/4	2/2	1,641/599
	Respective %	25.8/13.0	14.6/10.5	-	1.4/0.3	0.4/0.5	5.5/5.9	34.6/21.0	16.9/46.3	0.5/1.5	0.2/0.7	0.1/0.3	100.0/100.0
	Index*	100/100	100/100	-	100/100	100/100	100/100	100/100	100/100	100/100	100/100	100/100	100/100
1978	Numbers/Applications	240/90	107/70	3/3	1/1	12/5	293/49	1,018/111	345/345	16/16	2/2	4/4	2,041/696
	Respective %	11.8/12.9	5.2/10.1	0.1/0.4	0.04/0.1	0.6/0.8	14.4/7.0	49.9/15.9	16.9/49.6	0.2/2.3	0.1/0.3	0.2/0.6	100.0/100.0
	Index*	57/115	45/111	100/100	4/50	200/167	326/140	180/88	125/125	178/178	50/50	200/200	124/116
1979	Numbers/Applications	321/162	347/246	44/20	28/12	41/33	184/61	16,560/198	470/470	23/23	2/2	40/17	18,060/1,244
	Respective %	1.8/13.0	1.9/19.8	0.3/1.6	0.2/1.0	0.2/2.7	1.0/4.9	91.7/15.9	2.6/37.8	0.1/1.9	0.01/0.2	0.2/1.4	100.0/100.0
	Index*	76/208	145/390	1,467/667	122/600	683/1,100	204/174	2,921/157	170/170	256/256	50/50	2,000/850	1,101/208
1980	Numbers/Applications	1,915/522	556/388	56/45	60/27	18/16	388/164	5,837/244	586/586	21/21	2/2	11/8	9,450/2,023
	Respective %	20.3/25.8	5.9/19.2	0.6/2.2	0.6/1.3	0.2/0.8	4.1/8.1	61.8/12.5	6.2/29.0	0.2/1.0	0.02/0.1	0.1/0.4	100.0/100.0
	Index*	453/670	232/616	1,867/1,500	261/1,350	300/533	431/469	1,029/194	212/212	233/233	50/50	550/400	576/338
1981	Numbers/Applications	3,391/767	613/347	76/63	48/11	91/26	171/51	43,474/244	550/550	17/17	7/7	13/4	48,451/2,087
	Respective %	7.9/36.3	1.3/16.6	0.2/3.0	0.1/0.5	0.2/1.2	0.4/2.5	88.8/11.7	1.1/26.1	0.03/0.3	0.00/0.3	0.00/0.2	100.0/100.0
	Index*	920/683	255/551	2,533/2,100	643/550	1,517/867	190/150	7,667/194	299/299	139/189	175/175	630/650	2,983/348
	Numbers/Applications	6,790/1,619	1,863/1,114	179/131	160/53	163/83	1,126/360	67,456/923	2,228/2,228	86/36	17/47	70/35	80,143/6,649
	Respective %	8.5/24.3	2.3/16.7	0.2/2.0	0.2/0.8	0.2/1.3	1.4/5.4	84.2/13.9	2.3/33.5	0.1/1.3	0.00/0.3	0.1/0.5	100.0/100.0

* With 100 for 1977.

Table 2. Kinds of specimens submitted to diagnostic services

Specimen	1977	1978	1979	1980	1981	Total	Percentage
Whole body	275	269	465	604	462	2,075	2.4
Head	6	55	357	110	23	551	0.6
Brain	266	281	85	430	554	1,616	1.8
Internal organ	57	52	78	457	391	1,035	1.2
Blood	316	1,028	16,586	6,306	46,222	70,458	80.5
Blood smear	353	487	711	2,334	2,707	6,532	7.5
Feces	415	368	766	1,272	1,585	4,406	5.0
Others	17	65	103	464	179	828	1.0
Total	1,705	2,545	19,151	11,977	52,123	87,501	100.0
Index	100	149	1,123	702	3,507	-	-

Table 3. Number of kinds of specimens in respective animals submitted to diagnostic services

Animal	1977	1978	1979	1980	1981	Total	Percentage
Cattle	474	455	604	2,873	5,612	10,018	11.4
Buffalo	253	183	720	823	798	2,777	3.2
Horses	0	3	65	47	76	191	0.2
Sheep	23	1	60	118	59	261	0.3
Goats	6	27	57	21	143	254	0.3
Swine	90	489	350	486	241	1,656	1.9
Chickens	567	1,018	16,735	6,982	44,595	69,897	79.9
Dogs	277	343	470	593	551	2,236	2.6
Cats	9	16	22	21	21	89	0.1
Monkeys	4	4	2	2	8	20	0.02
Others	2	4	66	11	19	102	0.1
Total	1,705	2,545	19,151	11,977	52,123	87,501	100.0

Table 4. Result of diagnostic services - Cattle -

Name of disease	1977/'78	'78/'79	'79/'80	'80/'81	'81/'82	Total
Contagious kerato conjunctivitis			4/4			4/4
Infectious bovine rhinotrachitis					1/1	1/1
Brucellosis		3/1	18/10	26/14	16/12	63/37
Hemorrhagic septicemia	27/23	3/3			1/1	31/27
Malignant edema				1/1		1/1
Coli bacteriosis			12/8		2/2	14/10
Salmonellosis					1/1	1/1
Vibriosis				2/1		2/1
Ring worm disease				2/2	3/1	5/3
Surra - Trypanosomiasis		4/3	2/2	7/4	2/2	15/11
Babesiosis					1/1	1/1
Anaplasma infection	11/3	1/1		5/1	19/4	36/9
Piroplasmosis					1/1	1/1
Coccidiosis					2/2	2/2
Paramphistomum infestation		5/2	27/14	63/23	4/4	99/43
Paragonimus infestation			8/8			8/8
Schistosoma infestation			2/2			2/2
Liverfluke disease	1/1	1/1	4/4	6/4		12/10
Strongyloidosis			2/2	39/12	14/8	55/22
Bunostomum infestation	1/1	1/1	4/4	26/10	19/18	51/34
Ascaris infestation	2/1	5/3	11/11	8/6	8/7	34/28
Haemonchiasis	53/21	14/7	5/5	202/33	106/56	380/122
Trichuris infestation			2/2	3/2	2/2	7/6
Oesophagostomum infestation	9/4	5/1	3/3	6/4	14/3	37/15
Cooperia infestation	4/2		4/3	78/20	68/43	154/68
Ostertagia infestation			2/2	2/1	36/23	40/26
Nematodirus infestation			2/2	1/1	23/17	26/20
Trichostrongylus infestation					50/39	50/39

The denominator shows the number of applications pronounced as having the disease, and the numerator shows the number of animals pronounced as infected by the disease.

Table 5. Result of diagnostic services - Buffalo -

Name of disease	1977/'78	'78/'79	'79/'80	'80/'81	'81/'82	Total
Infectious bovine rhino-trachitis					2/1	2/1
Brucellosis		1/1	2/2	1/1	1/1	5/5
Hemorrhagic septicemia	23/18	7/4			1/1	31/23
Coli bacteriosis			7/4			7/4
Surra - Trypanosomiasis	8/5	4/4	4/3	11/7	5/4	32/23
Anaplasma infection	20/12			2/2	1/1	23/15
Coccidiosis					3/3	3/3
Piroplamosis				1/1		1/1
Paramphistomum infestation		5/5	24/6	29/19	2/2	60/32
Paragonimus infestation	2/1		1/1			3/2
Liverfluke disease		4/4	4/4	1/1		9/9
Strongyloidosis			2/2	16/6	4/3	22/11
Hemonchiasis				3/2		3/2
Ascariasis				7/4	16/12	23/16
Oesophagostomum infestation		2/2	1/1	1/1	1/1	5/5
Bunostomum infestation			2/2	4/3	2/2	8/7
Trychostrongylus infestation					2/2	2/2
Ostertagia infestation					1/1	1/1
Cooperia infestation			1/1	5/5	2/2	8/8
Nematodirus infestation			4/4	1/1		5/5
Scabies				2/1		2/1

The denominator shows the number of applications pronounced as the disease, and the numerator shows the number of animals pronounced as infected by the disease.

Table 6. Result of diagnostic services - Horse -

Name of disease	1977/'78	'78/'79	'79/'80	'80/'81	'81/'82	Total
Coli bacteriosis			1/1			1/1
Surra - Trypanosomiasis			1/1		2/2	3/3

The denominator shows the number of applications pronounced as having the disease, and the numerator shows the number of animals pronounced as infected by the disease.