

Preface

The National Veterinary Research Institute (NVRI) Vom occupies a strategic place in the present Agricultural Reform Agenda of the Federal Government. The Institute is the sole agency vested with the responsibility of Research and Development, the diagnosis, treatment and control of economically important diseases of livestock and poultry as well as zoonotic diseases in the country. Therefore, management and staff of the Institute have continued to engage in research activities that will promote the health and welfare of animals leading to increased productivity, food security and ultimately poverty eradication in line with the sustainable development goals. This Annual Report outlines major activities that took place in the year under review, highlights challenges encountered and made proposals for future research.

The Institute has continued to enjoy the goodwill and support from local and international organizations in terms of renovation and upgrade of infrastructures, trainings and manpower development and collaborative research. Worthy of mention are the International Committee of Red Cross, Propcom Maikarfi, Grand Cereal Nigeria Limited and ASF-Resist project. The room is still open to cooperate bodies and individuals to engage in research and development partnership with the Institute for the benefit of the Nigerian populace.

Armed with array of experts in various specialties, the Institute places premium on demand driven research and has continued to engage with partners in the agricultural sector to proffer solutions to recurring livestock and poultry diseases on the field. To this end, new vaccines were developed, or new formulations were produced to suit the needs and peculiarities of the teeming livestock and poultry farmers in Nigeria. In some instances, the Institute has produced and supplied vaccines to some neighboring countries on demand. This brings to fore the need for the urgent upgrading of the vaccine research and production facilities in the Institute in order to meet national and regional demands.

Considering the threat posed by emerging and re-emerging zoonotic diseases, and especially the role of wildlife in the epidemiology of these diseases, the Institute in collaboration with the Centre of Disease Control (CDC) USA and the Nigerian Field Epidemiology Training program jointly conducted passive and active surveillance activities to identify the possible reservoirs of Lassa fever virus in Nigeria. The research is still ongoing. Similarly, research activities to elucidate the epidemiology of Monkey pox virus in Nigeria, and 'Developing innovative and sustainable approaches to prevent the spread of African Swine Fever ASF in Africa ASF-Resist' are in progress.

A new organogram came into operation in the Institute during the year under review. This was done with the aim to encourage specialization, promote career progression, integrate modern cutting edge technologies and engender growth and expansion of the institute to cope with increasing demand in vaccine development and production as well as other diagnostic and extension services.

Several dignitaries were guest to the Institute during the year and the events were captured in pictures and presented herein. It is my pleasure to invite you to read through this report.

Dr. D. SHAMAKI (DVM, MSc, PhD, FCVSN)
Director/Chief Executive

Research Highlights

Mitigating the socio-economic effects of sheep and goat pox in Nigeria

Sheep and goat pox is a viral skin/muco-cutaneous infection leading to ill-thriftiness and lowered productivity of small ruminants. The socioeconomic effects of the condition are huge especially in severe cases in sheep and goats which may result in the death of affected animals. Early detection and treatment of the disease is key in mitigating its effects on the animals. Realizing the impact of this disease on the livelihood of small holder livestock farmers, NVRI Vom researchers and their counterpart from the Pirbright Institute, United Kingdom initiated a project entitled “Sero-survey of sheep and goat pox in selected states of northern Nigeria” with the aim of determining the prevalence and distribution of the condition in the study area. So far, the Team had earmarked and visited 60 villages in 44 Local Government Areas (LGAs) in Bauchi, Plateau and Kaduna States of northern Nigeria where 1800 sera were collected from sheep and goats and 300 questionnaires administered at household level. The samples are being analyzed in the laboratory. The results will be interpreted and communicated to the farmers accordingly. Necessary measures to prevent/control the condition will then be instituted.

E-Extension and Digitalization of Veterinary Extension Services

Livestock and poultry production provides employment and source of income to many Nigerians especially women and youths based in rural locale. However, optimal production in the livestock and poultry industry in Nigeria is rarely achieved due to disease conditions affecting the animals among others. There has also been the challenge of access to veterinary healthcare and information particularly in the rural areas, and there is an increasing need to deploy the use of community animal health workers to bridge this gap. E-extension is a means of using information and communication technologies (ICT) to facilitate extension delivery to these rural areas, which will also support the healthcare delivery by these workers. Therefore, an innovative platform is being developed in a Public-private partnership by Propcom Markafi to meet this demand via mobile phones. This will require essential database that will assist in prompt and accurate disease diagnosis and treatment, in order to improve the livelihood of smallholder livestock farmers in Nigeria. The first phase of this project required a baseline survey to be conducted by researchers at the NVRI Consultancy Unit and the Veterinary Extension and Liaison Services Division with

support from a Non-Governmental Organisation (NGO), Propcom Maikarfi. The survey commenced in December 2019. The objective of the baseline survey was to obtain disease benchmark with a true reflection of priority diseases of livestock across nine selected states, and identify community animal health workers that could be potential service providers to livestock farmers. The selected states are; Adamawa, Bauchi, Gombe, Kaduna, Taraba, Borno, Yobe, Jigawa and Kano. The developed application (App) is expected to effectively reduce the gap for access to extension messages, and subsequent adoption of proven animal health technologies. It is expected that the use of mobile phones can solve problems related to animal health care and other related animal husbandry practices.

ANIMAL INFLUENZA AND NEWCASTLE DISEASE LABORATORY

Mandate of the Laboratory

The Regional Laboratory is saddled with the following responsibilities: -

1. Diagnosis and research into avian diseases notably Newcastle disease virus, avian influenza virus, Infectious bursal disease virus, and Infectious bronchitis.
2. Preparation of viral transport media, antisera and antigens.
3. Field assessment of NVRI avian viral vaccines through sero-monitoring of vaccinated flocks.
4. Participating in national surveillance of avian influenza outbreak in suspected flocks.
5. Participating in national and international networks and surveillance for Emerging infectious/Transboundary diseases.
6. Rendering support to other West African Laboratories, as the Regional Reference Laboratory.

Laboratory Activities from January to December, 2019

The Laboratory was involved in Avian Influenza surveillance in live bird markets across 18 states of the federation. The avian influenza subtypes – H5N2, H5N8 and H9N2 were detected from the live bird market targeted active surveillance for 2019.

The result of the routine diagnosis and passive surveillance of avian influenza, Newcastle disease, Infectious bursal disease and fowl pox is presented on table 1.

Table 1. Summary of samples received and screened for viral agents in 2019

Number of samples				Number positive			
AIV	NDV	IBDV	Fowl pox	AIV	NDV	IBDV	Fowl pox
419	381	101	2	12	11	9	0

AIV=avian influenza virus, NDV=Newcastle disease virus, IBDV= infectious bursa disease virus

In the drive to fulfill our mandate the Division conducted field assessment of NDV vaccines through sero-monitoring of vaccinated flocks. A total of 945 sera samples were screened for sero conversion. The results were communicated to the farmers for necessary action either to administer a booster dose or treat for ongoing infection in the farm.

Equine Influenza Screening

During the period under review, the Division received 214 nasal swabs and tissues for the screening for equine influenza virus infection in horses. Of these, 58 samples were positive for

equine influenza virus by real time polymerase chain reaction (RT-PCR). Furthermore, in her capacity as a regional support laboratory for West Africa, the Division also received nasal swabs of horses from Niger Republic for equine influenza confirmation. The necessary confirmatory tests were conducted in the Division and the results were communicated accordingly.

Other Activities

1. The Division continued in the OIE twinning project on avian influenza with IZSve, Italy. This is aimed at improving NVRI laboratory capacity for better control of the Avian Influenza virus at National and Regional levels. Four members of NVRI staff were enrolled for the training. Some of the topics covered during the training include; biosafety and biosecurity measures for avian influenza and the application of classical and molecular techniques for the diagnosis of avian influenza. Others are the epidemiology and the use of geographical information systems for the monitoring of animal diseases.
2. The collaboration with CDC Atlanta/Nigeria and NCDC, FELTP on ecological surveillance of monkeypox disease in animals is still ongoing.

Achievements

1. Provision of diagnostic support and surveillance for animal viral diseases.
2. Detection of new subtype of avian influenza virus from active surveillance activities.
3. Staff of the Laboratory publishes research articles in peer review journals and also made scientific presentations at NVRI seminar and at conferences within and outside the country.

Challenges

1. The inverter in laboratory is faulty and can longer hold charges for long time; hence this affects the PCR runs.
2. There is need for the calibration of our pipettes by specialized companies to precision and accuracy of our reaction mix.
3. Insufficient biosafety cabinets in the laboratory. There is urgent need to service and repair faulty ones.

Future Plan

1. The twinning project will continue in 2020 with capacity building for other members of Staff
2. Active surveillance for highly pathogenic avian influenza virus in live bird markets may be conducted for other states of the country. This on-going collection, collation and analysis of data from live bird market will help in the prevention of future outbreaks as suspected cases will be properly handled.
3. Strengthening national and international networks and collaborations.
4. Expansion of our R & D products and services.

Applied Biotechnology Division

MANDATE OF THE DIVISION

- Research on the development of biological for animal diseases control.
- Investigation of animal disease pathogens using biotechnology techniques.
- Development and validation of biotechnology techniques for national diagnosis and research applications.
- Investigation of emerging & re-emerging infectious diseases and other zoonotic agents using biotechnology techniques.
- Conducting trainings on biotechnology methodologies for diagnosis and research.
- Serves as a centre for biotechnology collaborative research with DNA barcoding of animals, disease vector, invasive pests; national animal genetic resource and national and international research institutions and universities.

Table 1. Research and diagnostic activities on sample submitted within NVRI

Animal tested	Disease/Pathogen	Number of Samples	Submitting Division
ASF		145	CDL + Biotech
Rabies virus		5	CDL
PPR virus		100	VRD/VVPD/CDL
Leptospira		19	CDL
Salmonella		97	Bacteriology
E. coli		110	Bacteriology
Campylobacter		39	ABD
Eimeria		14	ABD
Plasmodium		100	ABD
Klebsiella		11	ABD
Brucella		4	Bacteriology
Total samples analyzed		644	

Table 2. Samples submitted from outside NVRI and processed on commercial basis

Disease pathogen targeted	Test conducted	No. of samples tested	Charges (₦)
Salmonella spp.	PCR	10	50, 000
Plasmodium spp.	PCR	20	50, 000
E. coli	PCR	60	30, 000
Cowpea disease	RAPD	82	50, 000
Risga spp.	PCR	12	72, 000
Plasmodium spp.	PCR	100	120, 000
PPR virus	RT-PCR	20	50, 000
Cryptosporidium spp.	PCR	22	68, 000
Total		226	490, 000

C. Other Achievements

1. Networking with International and Reference Laboratories for the diagnosis of special pathogens.
2. Molecular detection and characterization of various disease pathogens of livestock both for research and diagnosis; identification of novel strains of some disease pathogens (eg Campylobacter).
3. Assisting research students as well as staff members conduct analyses using molecular techniques to identify disease pathogens, gene fragments of biological interest, as well as analyses of sequence data.
4. PCR methodology training for 3 international scientists sponsored by IAEA. Also provided technical support for other trainings in collaboration with other Divisions within the Institute.
5. Currently participating in a 3-year research project on African swine fever (ASF), a collaborative research in partnership with Makerere University, Uganda, funded by the African Union research grant scheme. Project is to terminate in 2021.

D. Challenges

Many of the equipment in the centre require replacements and or maintenance services to enable optimal performance. The following are of topmost attention.

- i. The camera for the BioRad Gel documentation system is broken down and needs to be repaired or replaced.
- ii. An autoclave is urgently needed for sterilization of prepared reagents and consumables as well as decontamination of samples before disposal.

- iii. The Biosafety cabinets need general maintenance services and the pipettes require urgent calibration.
- iv. The inverter which serves to provide alternate source of power to run the Thermocyclers when there is disruption of power supply is faulty and needs to be repaired urgently.
- v. It has become imperative and desirable that the Centre discontinue the use of Ethidium Bromide (EtBr) dye known to be mutagenic for gel staining. Already some members of staff have report some signs consistent to the harmful effects of EtBr.
- vi. Purchase of PCR reagents and consumables for routine diagnosis and training are required for optimal diagnostic work.

G. Future Plans

The Division will continue with the ecological studies of the reservoir for viruses of the family Arenaviridae (Lassa virus, Lymphatic choriomeningitis virus, Mopeia virus, Luna virus, Gairo virus etc.) and determine the genetic diversity of Lassa viruses in Nigeria.

The natural host for these viruses is the multi-mammate rat (*Mastomys nataliensis*). The rodents are known to be widely distributed in Sub-Saharan Africa. Recently, new hosts other than the *M. nataliensis* have been incriminated as reservoirs of Lassa virus in the Republic of Guinea and in southern Nigeria. The diversity of Arenaviruses and Lassa virus is also on the increase. Lassa viruses have previously been isolated from humans and rodents in Nigeria and their pathogenesis evaluated in primates. In this study in Northern Nigeria, the diversity of circulating Lassa viruses and other Arena viruses will be determined.

Candidate Lassa fever vaccine strains specific to Nigeria can be selected from field isolations. This study is in collaboration with researchers from a specialized P4 laboratory in Canada.

BACTERIOLOGY DIVISION

The Division is saddled with the responsibility of conducting research into economically important bacterial diseases of animals. In order to achieve this mandate therefore, the Division was organized into specialized laboratories charged with the following responsibilities:

- a) Isolation, identification and characterization of *Salmonella* from both infected and apparently healthy livestock and poultry.
- b) National surveillance, diagnosis and research on Mycoplasmosis of livestock and poultry.
- c) Phenotypic, serological and molecular diagnosis of *Brucella* infection in animals.
- d) Isolation and identification of *Pasteurella* species of veterinary importance
- e) Production of biologicals and reagents for diagnosis of bacterial pathogens
- f) Teaching of students on Industrial attachment and supervision of students projects.

ROUTINE ACTIVITIES

In the *Salmonella* Laboratory, a total of 1545 samples comprising of animal and human feces, water, intestinal swabs, abattoir wastes and environmental samples were received from clients outside the Institute and processed using pre-enrichment media for the isolation of *Salmonella* and *Escherichia* species. Overall, 200 samples were positive for *Salmonella* species while 43 samples were positive for *Escherichia* species. Additionally, 42 samples were received from various Divisions of the Institute for bacteria isolation and identification. Three of the samples produced growths consistent with the phenotypic morphology of *Salmonella* species.

Considering the threat posed by the widespread antimicrobial resistance (AMR) globally, the need to assess the level of AMR in the country and the drive for good antimicrobial stewardship, the Division conducted antimicrobial susceptible testing (AST) on 38 *Salmonella* species isolates. The results will be published in due course.

During the period under review, 412 samples (tissues, swabs and sera) were received and processed in the *Mycoplasma* Unit for the isolation and identification of *Mycoplasma* species infections in cattle, goats and poultry. Sixty-four (15.5%) of these samples were positive for *Mycoplasma* species, signifying that Mycoplasmosis constitutes a threat to the health and wellbeing of animals in the country. Taking this into consideration, the Division has drafted a research proposal entitled “***The development of a novel vaccine for the effective control of CBPPP in Nigeria***” as a priority project of the Institute. However, the project could not commence due to paucity of funds. In the interim, preliminary work on collating and preserving isolates of MmmSC is ongoing.

The *Brucella* Research Laboratory received 1,094 sera and 102 tissues and 6 milk samples for routine serological diagnosis. Similarly, 100 dog and 57 human sera were analyzed for *Brucella* species infection as part of students projects. Furthermore, a survey of camel brucellosis was carried out in Kano and Jigawa states as well as on a livestock farm in Zangon-Kataf with a history

of persistent abortion in the herd. Likewise, a survey of brucellosis was carried out on 262 cattle, 14 sheep and 13 goat serum samples submitted by the Kastina state government. Generally, there appear to be low prevalence of *Brucella* infection in animals screened. More sensitive techniques will be employed in the future to determine the veracity of the current methods used in our laboratory.

Forty-five samples; allantoic fluid (n=31), swabs (n=12) and lung tissue (n=2) were received and processed in the *Pasteurella* Unit. Ten of the allantoic fluids were positive for *Pseudomonas auregenosa* while four showed growth of *Bacillus* species. Similarly, six of the 12 (50%) swabs tested were positive for *Pseudomonas auregenosa*. There was no bacterial growth from the lung tissues submitted.

Bench space and research project supervision

The Division provided bench space and supervised student projects ranging from National Diploma to PhD levels.

Students' Industrial Work Experience Scheme (SIWES) and or industrial training

A total of 192 students from different institutions of higher learning in the country were admitted and trained on various laboratories skills in the various laboratories of the Division during the year under review.

Challenges

- Lack of funds to conduct research projects proposed by the Division
- No internet facility to aid research activities
- Inadequate laboratory equipment like autoclave, deep-freezer etc
- Lack of regular servicing and maintenance of equipment which has led to malfunction or breakdown of some equipment in the Division.
- Insufficient working space which results to undue contamination of experiments
- Inadequate media and reagent which slows the work or leads to incomplete work
- Inadequate office space

V. Future plan

- Intensify the sourcing of external research grants for funding of research projects in the Division
- Large scale antimicrobial susceptibility testing
- Antimicrobial resistance surveillance
- Isolation of *Brucella* spp. from small ruminates, canine, camel, donkeys, pigs and wildlife.
- Complete genome sequence studies of Nigerian *Brucella* and *Pasteurella* isolates.
 - Development of experimental iron regulated outer membrane protein vaccine against Pasteurellosis

BACTERIAL VACCINES PRODUCTION DIVISION

The mandate of the Division is to develop and produce bacterial vaccines to meet national needs and other solicited demands.

During the year under review the Division conducted the following specific activities in line with her mandate.

The Division was given a facelift in conformity with Current Good Manufacturing Practice (cGMP)

Achievements

- Most of the Bacterial Vaccines were produced (Table 1) thus, meeting most of the field demands. In total over 16 million doses of assorted veterinary vaccines were produced.
- The Cold Rooms and equipment such as autoclaves, deep freezers and incubators were repaired and maintained throughout the year which assisted in improving our efficiency.

Table 1. Types and quantity of bacterial vaccines produced in the year 2019

Type of Vaccine	Total bottles/vials produced	Total doses produced
Anthrax Spore	5,107	2,042,800
Brucella 19 V	NIL	NIL
Black Quarter	6,968	3,484,000
Contagious Bovine Pleuropneumonia	59,174	5,917,400
Fowl Cholera	1,917	383,400
Fowl Typhoid	39,464	3,946,400
Haemorrhagic Septicaemia	8,528	341,120
Hantavac	4,890	195,600
Total	126,048	16,310,720

Challenges

- Inadequate Horse serum which is a vital ingredient in CBPPV impeded its production in the desired quantity
- Inadequate number of staff to man the activities of vaccine production.

Future Plan

- Research to improve the shelf life of Fowl Cholera Vaccine.
- Research on the development and production of freeze-dried Anthrax Spore Vaccine.

BIOCHEMISTRY DIVISION

MANDATE AND FUNCTIONS

The mandate of the Division is “*To conduct research into all aspects of Animal Nutrition, Veterinary Toxicology, Chemical Pathology and Drug Development for the prevention, treatment and control of Animal diseases*”. The Division is subdivided into four sections namely: Nutrition, Toxicology, Clinical Biochemistry and Drug Development.

RESEARCH and ROUTINE ACTIVITIES

The following research projects were conducted during the period of the report.

1. Evaluation of compounds isolated from some plants for antidiarrheal activity
2. Ameliorative effects of ethanolic and aqueous extracts of *Piliostigma thonningii* pod on ethanol-induced gastric mucosal damage in Wistar rats.

The Division perform routine sample analysis (commercial, research and diagnosis) on various sample types submitted during the year under review.

A total of five hundred and seventy-seven samples (577) were analysed in the various sections of the Division during the report period. Out of which, four hundred and fifty (450) were commercial samples, while the remaining one hundred and twenty-seven (127) were NVRI internal samples for research and diagnosis. The commercial samples analyses generated a total sum of eight hundred and sixteen thousand seven hundred and fifty naira only (N816,750.00) from Clinical, Nutrition and Toxicology Sections in the tune of N325,250; N228,000 and N263,500, respectively. Moreover, the Drug Development Section of the Division produced about one thousand (1000) litres of distilled water for use in the Divisional labs and other Departments of the Institute.

ACHIEVEMENTS

A. Training

Staff of the Division successfully trained and mentored eight Interns invited for 2019 NEF-NVRI Toxicology program.

Similarly, several students from various tertiary institutions across the nation were trained in various laboratory aspects of Biochemistry.

The Division organized a hands-on training workshop on chromatographic separation of phytochemicals.

B. Setting up of a new laboratory

The Division in collaboration with Federal Department of Livestock (FMARD) set up a Bee Honey laboratory in the Institute to enhance research and analytical works. This is preparatory to exploring the possibility of exporting honey from the country as a foreign exchange earner.

Challenges

1. The new auto amino acid analyser procured for the Division since 2009 is still awaiting installation and training despite our applications and follow-up since July 2014.
2. The High performance liquid chromatography (HPLC) procured for the Division in 2009 has been installed and training took place. However, chemicals and reagents needed for the commencement of HPLC analysis are yet to be procured since last application in July 2017. Due to non-use of the machine some leakages developed in some of the tubes which are yet to be detected and fixed.
3. The Atomic Absorption Spectrophotometer (AAS) that was installed and fully functioning in May 2014 and was reported to have some leakages in August of same year. This equipment is still not functioning despite a visit by the Service Engineer. This is hindering micro and macro mineral elements analysis.
4. The chemistry auto-analyzer (ACCENT 300) that was installed with training provided to some staff has not been functioning since it was last repaired and serviced in September 2015 by the Service Engineer and reagent kits procured.
5. Fluctuations in power supply is a general issue causing frequent damage to electric cables and thus affecting sample digestion in the fume cupboard.
6. Lack of constant water supply to the labs greatly affected many activities.
7. Reagents needed for our work are not usually available in the Institute stores
8. Inadequate office furniture to accommodate some old and newly employed staff and students on industrial attachment, thus causing serious challenges in the labs.
9. Breakdown of freeze-drying machine and lack of critical equipment such as rotatory evaporator, large soxhlet extraction apparatus, UV viewing chamber, sensitive weighing balance in Drug Development section is affecting the work output.

Future Plan

1. To work towards fixing or replacing the 4 major non-functioning equipment and other minor ones in the Division
2. To introduce new analysis parameters when the High Performance Liquid Chromatography (HPLC) and Amino Acid Analyser are installed and is fully functional
3. To include 2 parameters (acid and neutral detergent fibre tests) for analysis in Nutrition lab as well as 5 parameters (GSH, MDA, SOD, DPPH & catalase tests) for Clinical Chemistry lab, and improving the turnaround time for the diagnoses of poisonings and food contaminants in the Toxicology laboratory.
4. To vigorously pursue some uncompleted research projects to logical conclusion.
5. To start preparations for hosting of 2020 NEF Program.
6. Plan to develop an *in vitro* cell and tissue culture toxicity laboratory to reduce the

- frequent need for and use of lab animals.
7. To embark on research entitled “Assessing the level of adherence to standards on poultry feed formulation - A ten-year retrospective study” by Nutrition Section.
 8. To support the Bee and Honey Programme in the National Residue Monitoring Programme of the Federal Government for the EU Third Country listing, which is a market access requirement for the export of honey to the EU market.

CENTRAL DIAGNOSTIC LABORATORY (CDL)

The Diagnostic Division under the Department of Diagnostic and Extension, contributes significantly to the institute's role as a national and regional laboratory for Avian Influenza and other Transboundary Animal Diseases for West and Central Africa. The Division also conduct clinical outreaches (ambulatory services) to farms, diagnosis of emerging and re-emerging diseases and surveillance activities within the nation and the sub-region as situations warrant.

ROUTINE ACTIVITIES

During the year under review the Division received and processed several samples in the various units as follows:

a). Necropsy Unit

In keeping with the policy of the Unit to produce interim reports of diagnosed cases within 24 hours of examination and a final report as soon as possible upon receipt of ancillary laboratory results, the unit undertake the following during the period under review.

- Provide diagnostic services (ante and post-mortem examination) on 893 samples and issued out results with appropriate recommendation for treatment or disease control to clients.
- The samples received comprises of carcasses of 670 chicken, 99 cattle, 70 sheep, 44 goats and 10 pigs.

b). Histopathology Unit:

The unit provide support services by producing and examining histological slides to confirm tentative diagnosis of suspected diseases during post-mortem examination. To this end 1411 histo-slides were processed and examined to aid in disease diagnosis.

C). Incinerator Unit:

- The incineration unit successfully incinerated waste materials from Plateau State Ministry of Health and World Health Organization on human vaccination for measles, tetanus, polio, yellow fever over the review period.
- During the year a total of 37,212 kilogram of waste material from outside and within the Institute were incinerated. The sum of over five million naira was generated from services render to clients.

d). Epidemiology Unit

This unit is saddled with responsibility of data collation and sorting, appraisal and analysis to provide evidence based information that will enable the formulation and implementation of timely and cost-effective control measures. The data generated from the Division is also used to model disease scenario on the field in order to assist research scientists and policy makers in prioritizing research or formulating guidelines for safeguarding the health of animals and man. to formulate

During the period under review the Unit was involved in:

- Data collation, sorting and quick appraisal of data on the current avian influenza for timely intervention as the situation demands in the states of the federation were cases were diagnosed and confirmed by the institute (CDL & Regional laboratory).
- Reporting to designated authorities on outcome of analysis of the information on the confirmed avian influenza outbreaks for the year.

e). Clinical Pathology Laboratory Unit

The unit routinely conducts analyses of samples (blood/serum) for the assessment of haematological parameters, thereby assisting in diagnosis and research. The unit also prepares reagents for clinical pathology and haematology analyses.

During the period under review the Unit received 588 samples for analysis of various haematological parameters. The samples comprised of 231 from chicken, 102 from rabbits, 111 from dogs and 58 fish samples. Other are 45 from sheep, 34 from cattle and one each from horse and pig.

f). Small and Large Animal Experiment Stations

The Small Animal Experimental Section engages in the breeding of experimental animals (mice, rats, guinea pigs and rabbits) for research. It services as a vital resource for the multiplication of various laboratory animals to meet the demands of researchers within and without NVRI Vom. The Small animal experimental station has 526 albino mice and 10 albino rats in stock.

The Large Animal Experimental Station provides housing and conducive environment for the rearing of large and small ruminants and poultry for research purposes. The section successfully assisted project students and staff of the Institute to carry out their research projects.

Challenges

In trying to fulfil her mandate and add to the overall achievement of the Institute the Division is faced with several challenges including but not limited to the following;

1. Shortage of skilled manpower to handle some of her activities.
2. None availability of consumables such as samples bottles, Universal bottles, hand gloves, nose mask, (protective kits) detergents, formalin, xylene, Hematoxylin and Eosin stains.
3. Faulty/obsolete equipment.
4. Lack of ambulatory services vehicle.
5. Non availability of a cold room (+2 - +5°C) as part of the Post-Mortem facility for the preservation of carcasses and tissue samples.
6. Lack of specialized epidemiology and statistical software and computers that will enhance epidemiological analyses and disease modelling
7. Lack of internet services
8. Lack of personal protective equipment (PPE).
9. The Large Animal Experimental houses/pens are dilapidated and need to be renovated.
10. Frequent breakdown of the borehole leading to inadequate water supply.

Future plans

These challenges notwithstanding the Division plans to undertake the following with the assistance of the Institute as a way forward in the coming years.

1. Provision of an ambulatory vehicle for field outreach and ambulatory services to farmers across the nation.
2. Provision of research microscopes with camera to ease histological reading of histopathology slides in line with the international practice.
3. Provision of laboratory consumables and laboratory protective wears.
4. Installation of cold room (+2 - +5°C) as part of the post mortem facility for the preservation of carcasses and tissue samples.
5. To procure and install a new incinerator in place the old one (over 40 years) due to increase cost of maintenance.
6. To restock the Small Animal Experimental Unit with new breeds of experimental animals (mice, rats, guinea pigs and rabbits).
7. Repair of faulty equipment and routine servicing of equipment to prevent breakdown and enhance precision and efficiency.

DAGWOM FARM

The Dagwom Farm is a Division of the National Veterinary Research Institute (NVR) Vom under the, Livestock Department. It comprises of the Feed Mill, Rabbitry, Store and Fabrication sections. The four sections are known for excellence in productivity and research. Therefore, the assigned objectives relevant to the institute's mandate and mission were carried out adequately.

The mandate includes: -

- a. Production of standard quality livestock feeds to support vaccine production and research
- b. Research and formulation of appropriate livestock feeds for improved performance.
- c. Production of rabbits for replacement and extension to interested organizations, institutions and individuals
- d. Investigation of common diseases of rabbit to improve performance.
- e. Research and fabrication of affordable kerosene incubators with high efficiency.

RABBITRY SECTION

Over two hundred thousand (₦ 200,000.00) naira was realized from the sales of rabbits during the year under review (Table 1).

Table 1. Rabbits production for research, replacement and sales in 2019

S/N	Categories of rabbits	Opening stock	Closing stock	production	sales	Amount (₦)
1	Does	107	29			
2	Bucks	44	10			
3	Growers	4	-			
4	Weaners	36	2			
5	Litters	62	1	324	111	229,900
6	Total	253	42	324	111	229,900

STORE SECTION

In 2019 no materials were received by the store section, all transactions were done on direct purchase basis.

FEED MILL SECTION

During the period under review, eighty-eight thousand two hundred and two tons of assorted feeds were produced and distributed to various Divisions of the Institute (Table 2).

Table 2. Feed Production and Distribution

FEED TYPE	POUL	D/F	DIAG	FCMLT	BIO CHEM	RLAI& TAD	R.LAB	QCD	VR	D/F TRIAL	TOTAL (TONS)
QLM	25,500										25,500.0
LM	12,750					100					12,850.0
GP		7,137	6.92		2,400	460	660	1,770	75		19,427.5
GM		175.0				375		4,250	125		4,925.0
CM	25,500										25,500.0
Total (tons)	63,750	7,312	6.92		2,400	935	660	6,020	200		88,202.5

QLM=quail layers' mash, LM= layers mash, GP= grower's pellets, GM= growers mash, CM= Chicks Mash

SOYA BEANS PROCESSED IN THE YEAR

Approximately 23596 kg of Soya beans was received and processed during the review period. The sum of 341900 naira was realized from the sales of the soya bean cake produced (Table 7.3).

Table 3. Quantity of soya beans received and processed in 2019

Period	Quantity of soya beans and soya products								Amount(₦)
	Received (kg)	SBC prod (kg)	FF prod (kg)	SBC used (kg)	FF (kg)	oil sold/SLU DGE/used (litres)	oil sold/used (litres)		
JAN-DEC	23,596.00	16,845.70	3,991.75	16,234.70	3,334.00	1,429.00	1,516.0	341,900.00	

FABRICATION SECTION

Although the unit proposed to construct 132 units of kerosene powered incubator, only six were produced and four of them were sold (Table 4).

Table 4. Activities and projections for construction of kerosene powered incubator

	B/F	No constructed	No. construction	under Sold	Target	Cost per unit	Total
1 st quarter	-	-	-	3	33	105,000.00	315,000.00
2 nd quarter	-	3	-	-	33	-	-
3 rd quarter	-	-	-	-	33	-	-
4 th quarter	-	3	3	1	33	105,000	105,000.00
Total	-	6	3	4	132		420,000.00

CHALLENGES

- Low productivity and intermittent breakdown of some oilseed processing unit machines (Extruder, Expeller and Auger) due to ageing.
- Lack of good storage facilities for feed materials / ingredients.
- Lack of a weigh bridge to determine actual quantity of raw materials (feedstuffs) received from suppliers.
- Lack of a stationed vehicle for feed mill operations.
- Lack of grains pre-cleaning machine.
- Lack of water supply to feed mill for extruding and pelleting of feed (bore hole)
- Lack of protective clothing like lab coats, overalls, safety boots, head gear, nose masks, raincoats and rain boots for staffs and visitors in the feed mill line with bio-safety requirements.
- Insufficient tools and machines (guillotine machine, folding machine, rolling machine and wood work multi-purpose machine (3D machine).
- Delay in release of funds approved for various farm operations.
- Requirement for drugs, disinfectant and consumables.
- Lack of internet services on the farm, this encourages staff movement out of the station in search of internet services

FUTURE PLANS

- The Rabbitry section plans to produce 475 rabbits of different breeds
- The Feed Mill targets to produce 101,345kg of feeds, 18,935kg of soya bean cake, 4,695kg of full fat soya, and 16,451 litres of oil.
- The Fabrications Unit plans to produce of 30 set of kerosene powered incubators in the coming year
- There are plans to conduct a research on the hybridization of the kerosene powered incubator for cost effectiveness.

DERMATOPHILOSIS, IMMUNOLOGY AND MYCOLOGY DIVISION

S/NO.		
1.	FUNCTIONS/MANDATE	<ul style="list-style-type: none"> i. To conduct research on <i>Dermatophilus congolensis</i> and related skin infections of livestock. ii. To develop vaccine for prevention and control of animal skin diseases. iii. To carry out immunological studies on <i>Dermatophilus congolensis</i> and other pathogens of animal diseases. iv. To conduct research on mycotic agents in animals. v. To develop ethno-veterinary products for the treatment of animal skin diseases.
2.	SPECIFIC ACTIVITIES	<ul style="list-style-type: none"> 1. <u>Microbiology Lab.</u> <ul style="list-style-type: none"> a. Animal samples processed – 22 cases <ul style="list-style-type: none"> i. Caprine - 2 ii. Canine - 1 iii. Porcine - 2 iv. Avian - 6 v. Ovine - 4 vi. Bovine – 5 b. Vaccine samples processed – <ul style="list-style-type: none"> i. Vaccine – 2 c. Organisms isolated from animals – <ul style="list-style-type: none"> i. Trichophyton species -2 ii. Aspergillus species -6 iii. Candida species - 5 iv. <i>Dermatophilosis congolensis</i> - 2 v. Bacillus species - 2 vi. Rhizopus species - 1 vii. Mucor species - 1 viii. No growth – 3 d. Human samples processed – 440 cases <ul style="list-style-type: none"> Organism isolated; i. Streptococcus spp =1 ii. Candida =70 iii. Mucor =66 iv. Trichophyton =150 v. Aspergillus =43 vi. Trichosporon =14 vii. Staphylococcus =43 viii. Rhizopus =4 ix. Bacillus =11 x. Geotrichum =3

		<ul style="list-style-type: none"> xi. Sporothrix =8 xii. Penicillium=7 xiii. Curvularia =3 xiv. Bipolaries =2 xv. Microsporum =4 xvi. No fungal growth =11 <p>2. Ethno veterinary Production Unit 30kg of <i>Cassia alata</i> powder and 40kg of <i>Tarmilalia</i> species powder (medicinal plants) leaves and bark grown in our herbarium was obtained_during the year. This was used for the production of Dermatocide products.</p> <p>The following products were produced during the year;</p> <ul style="list-style-type: none"> i. Dermatocide soap – 4,198 ii. Dermatocide ointment (120g) - 501 iii. Dermatocide ointment(40g) - 307 iv. Dermalol ointment – 1,000 v. Lamstreptocide A&B – 490 <p>3. Training Four staff of Federal Medical Centre Owerri, underwent proficiency training in the Division on mycological techniques and diagnosis for a period of one (1) month in two batches and certificates were issued to them.</p>
3.	ACHIEVEMENTS	<ul style="list-style-type: none"> - Various fungal and bacterial species diagnosed from 440 human samples. The revenue generated from laboratory services to patient amounted to N341,599.00 - New product was also developed (Dermalol ointment) and commercialized. - 1000 Dermalol ointment was produced: Value at N500,000.00 - 501 Dermatocide ointment (120g) was produced. Value at N300,600 - 307 Dermatocide ointment (40g). Value at N76,750.00 - 4,198 tablets of Dermatocide soap. Value atN1,049,500 - 490 Litres Lamstreptocide A&B. Value at N735,500

4.	CHALLENGES	<ul style="list-style-type: none"> i. Inadequate reagents and materials for work in Microbiology laboratory ii. Non-functional Biosafety cabinet iii. Lack of reagents for Immunology work iv. Lack of funds to carry out new research projects.
5.	FUTURE PLAN	<ul style="list-style-type: none"> i. To undertake surveillance, sampling and isolation of <i>Dermatophilus congolensis</i> in cattle in Plateau State. ii. To evaluate the efficacy of various plant extracts against <i>Dermatophilus congolensis</i> and fungal isolates. iii. Development and formulation of a skin lotion containing neem oil extracts. iv. To fully equip the immunology laboratory to make it functional for immunological work.
6	RESEARCH HIGHLIGHTS	<p>Dermasol ointment was produced with active ingredients that have antifungal, antibacterial and kerotolytic activity. The ointment was tested on the following skin conditions; acne, hayfever, skin redness (rosacea), dandruff, scaly and red skin patches (seborrheic dermatitis), and itchy skin infection caused by mites (scabies), lice, cold sores, warts, fungi and eczemas. The results were excellent.</p> <p>Lamstreptocide was produced from bitter leaf extract and other ingredients and tested on <i>Dermatophilus congolensis</i> infected cattle.</p> <p>Analysis of the result is in progress.</p>

HUMAN RESOURCE MANAGEMENT

Records and Documentation Unit

This Unit of the Institute is saddled with the following responsibilities:

Maintenance of Staff Records of Service (ROS) as well as the following.

-Processing of staff Leave such as Maternity Leave, Annual Leave, Examination Leave, Sick Leave and Casual Leave as well as and any other Leave as may be approved by the Director/Chief Executive.

-Compilation and processing of documents for both junior and senior staff graded files. The Unit is responsible for keeping records of both junior and senior staff on: appointments, severance, retirement, deaths, dismissal, termination, updating of staff nominal roll and trainings

During the period under review the Unit recorded 62 appointments, 15 retirements, 5 transfer of service, 46 trainings and 4 deaths.

Establishment Unit

The Establishment Unit is saddled with the responsibility of: Appointment, promotion and disciplinary cases for staff, handling of both Open and Secret Registries of staff, preparation of quarterly/annual reports for the Division and also liaising with the Records Unit to update staff nominal roll. The Unit equally coordinates general duties in the Institute as well as assists in the implementation of the Institute's policies and interpreting Government circulars and extant rules and regulations.

In the period under review, the Establishment Unit handled the following; promotion of 232 senior and 33 junior staff, the advancement of 10 senior and eight junior staff, confirmation of 30 senior and 12 junior staff as well as the appointment of 60 senior and two junior staff. No disciplinary case was handled during the period under review.

LABOUR, NHIS, SIWES & NYSC OFFICE

The Labour, NHIS, SIWES & NYSC Office is saddled with the following responsibilities:

- Encourage a harmonious working relationship between the Management of the Institute and the Unions.
- Coordinate staff NHIS Scheme
- Receive, coordinate and supervise SIWES Program in the Institute
- Accept and coordinate Youth Corps members posted to the Institute
- Attending to students on educational visit and excursions in the Institute.

In the year 2019, the Office has been able to achieve the following:

National Health Insurance Scheme (NHIS): A total of 66 cases in regards to new registration of staff members (12), change of Health Care Providers (23), addition of dependents (29) and application for the addition extra dependents (2) were attended to.

NYSC CORP MEMBERS

A total of 16 Corp members served in the various Divisions/Departments of the Institute during the period under review.

EDUCATIONAL VISITS

The following category of schools came to the Institute for educational visit:

- Tertiary Institutions 15
- Secondary Schools 27
- Primary Schools 5

SIWES

SIWES is a skills acquisition and development programme designed to prepare University, Polytechnics/Monotechnics and Colleges of Education students for transmission from school environment to work environment.

Table 1. List of Universities, number of students and duration of SIWES in NVRI

S/N	Name of Institutions	No. of students	Duration
1.	Convent University, Ogun State	1	May – August, 2019
2.	Modibo Adama University of Technology, Yola	28	August, 2019 - January, 2020
3.	Bayero University, Kano State	2	April – October, 2019
4.	Bingham University, Karu, Nasarawa State	2	March – September, 2019
5.	University of Jos	52	August, 2019 – January, 2020
6.	Veritas University, Abuja	1	March – September, 2019
7.	Coal City University	1	August – December, 2019
8.	Umaru Musa Yar Adua Univeristy, Katsina State	3	September, 2019 – March, 2020
9.	Federal University of Technology, Minna	1	July – December, 2019
10.	National Open University of Nigeria	5	March – December, 2019
11.	University of Abuja	8	November, 2019 – March, 2020
12.	Gombe State University	6	November, 2019 – March, 2020
13.	University of Mkar, Gboko, Benue State	14	June – November, 2019
14.	Ahmadu Bello University, Zaria, Kaduna State	8	July – December, 2019
15.	Abubakar Tafawa Balewa University, Bauchi	15	April – October, 2019
16.	Michael Okpara University of Agriculture, Umudike, Abia State	1	April – October, 2019
17.	Nasarawa State University, Gashua, Yobe State	6	July – December, 2019
18.	Federal University, Gashua, Yobe State	1	May – October, 2019
19.	Nnamdi Azikwe University, Awka	3	July – December, 2019
20.	Federal University, Lafia, Nasarawa State	22	July – December, 2019
21.	Enugu State University of Science & Technology, Enugu	1	June – December, 2019
22.	University of Maiduguri, Borno State	4	June – September, 2019
23.	Bauchi State University, Gadau	2	November, 2019 – March, 2020
24.	Taraba State University, Wukari	1	July – November, 2019
25.	Plateau State University, Bokkos	40	September, 2019 - March, 2020
26.	University of Ilorin, Kwara State	13	August – October, 2019
27.	Usmanu Danfodiyo University, Sokoto	1	September – October, 2019
28.	Adamawa State University, Mubi	10	September, 2019 – March, 2020

Table 2. List of Colleges, number of students and duration of SIWES in NVRI

S/N	NAME OF INSTITUTIONS	NO. OF STUDENTS	DURATION
1.	College of Education, Gindiri	1	November, 2019 – January, 2020
2.	Federal College of Forestry, Jos	3	July – November, 2019
3.	College of Agriculture, Lafia	1	August – November, 2019
4.	Federal College of Animal Health & Production Technology, Vom	67	September, 2019 – January, 2020
5.	Federal College of Education, Pankshin	1	July – October, 2019
6.	Plateau State Polytechnic	14	October, 2019 - February, 2020
	Total	86	
	Grand Total	311	

LEGAL UNIT

The Unit serves as adviser to the Institute on legal matters. It also handles criminal and civil cases of the Institute in liaison with the External Solicitors and the Legal Department of the Federal Ministry of Agriculture and Rural Development. The Institute had handled about six (6) cases in 2019 which are at various stages.

Table 3. List of NVRI pending cases at various stages

S/N	PARTIES	SUIT NO.	COURT	CURRENT STATUS OF THE CASE
1.	i. National Veterinary Research Institute, Vom ii. Dr (Mrs.) L. H. Lombin and Dr Samuel O. Ogunjumo	Suit No.: CA/J/291/2018	Court of Appeal, Jos Division	The Institute had entered an appeal against the judgment obtained. Records had been compiled and transmitted to Court of Appeal, Jos. Applicant Counsel had filed their Brief of Argument and had moved motion for the regularization of the processes which was graciously granted by the Court. The Respondent has 30 days within which to file its Respondent Brief which he has not done. The Applicant Counsel had filed a motion praying the Court to hear the appeal on the Applicant's Brief. The matter was adjourned to 13 th February, 2020 for the motion to be moved and granted
2.	i. National Veterinary Research Institute, Vom ii. Dr. (Mrs.) L. H. Lombin and Mr. Rueben Awanye Itruman	Suit No.: CA/J/276/2018	Court of Appeal, Jos Division	The Institute had entered an appeal against the judgment. Records have been compiled and transmitted to the Court of Appeal. Applicant Counsel had filed Brief of Argument and a motion for the regularization of the processes which was moved and graciously granted by the Court. The Respondent's Counsel had equally filed Respondent's Brief. The matter was adjourned to 13 th February, 2020 for hearing.
3.	Mallam Muhammad Nasir Ambursa (Claimant) and i. Hon. Minister of Agriculture and Rural Development ii. The Executive Secretary, Agricultural Research Council of Nigeria A(RCN) iii. National Veterinary Research Institute, Vom	NICN/ABJ/213/2 018	National Industrial Court of Nigeria, Abuja	The case was instituted in 2018 at the National Industrial Court, Abuja. The case had commenced. Applications filed by respective parties through their counsel for the regularization of processes were heard and processes filed out of time were also taken. The matter was adjourned to 6 th February, 2020 for hearing of the substantive suit.

	iv. Mr. E. J. A. Okwori, Federal College of Veterinary & Medical Laboratory Technology (Respondents)				
4.	Plateau State Board of Internal Revenue and National Veterinary Research Institute, Vom	SC/900/2014	Supreme Court of Nigeria		The suit was filed at the Federal High Court and Ruling was delivered in favour of the Institute. Claimant appealed against the Ruling of the Court of Appeal, Jos with Suit No. CA/J40/2013. Notice of Appeal was filed at the Supreme Court, Abuja because the Claimant was still dissatisfied with the Court of Appeal Ruling. Meanwhile, NVRI, Vom was invited by the Plateau State Board of Internal Revenue Service for a special meeting with the Office of the Accountant General to harmonize the figure and negotiate on how to pay the agreed sum. PSIRS also agreed to withdraw the case from the Supreme Court, Abuja.
5.	Mr. Segun Babatunde Akinola and National Veterinary Research Institute, Vom	KDH/KAD/1039/2011	High Court, Kaduna		Case has gone through trials and judgment was delivered on the 2 nd August, 2019 in favour of the Institute for lacking merit.
6.	Attorney General of the Federation and Attorney General of Lagos State	Suit No. SC/358/2013	Supreme Court, Abuja		Parties had resolved the dispute amicably and judgment as per terms of settlement was entered on the 6 th May, 2019 based on the Terms of Settlement filed on the 30 th April, 2019.

INSTITUTE'S LANDED PROPERTIES IN LAGOS STATE

Omole Residential Scheme Block 34, Plot 885.

The Institute's team visited the site during the year. However, the Institute is yet to receive the C of O of the 5,000 square meters property from the Lagos State Government.

Ikorodu Land

This is covered by C of O No. 17/17/1987D, located at Ikorodu Industrial Layout with an area of 25.82 hectares of land allocated to the Institute for the purpose of research.

The Institute contacted the Company, MAS-FAD & Co Limited, and it confirmed that the Institute is the authentic owner of the land. However, through continuous acts of encroachment by Messrs Lucky Fibres Industry and the illegal land speculations, the land had drastically reduced in size with various developmental projects already located on the site.

There was communication on this recommendation to the Federal Ministry of Agriculture and Rural Development’s Legal Adviser to initiate legal actions against Messrs Luck Fibres based on the Institute’s Governing Board’s Resolution at its Meeting of 29th July, 2010.

There has been no information on the matter from the Federal Ministry of Agriculture and Rural Development’s Legal Unit even when some Legal Officers were sent to the Lands Property to confirm the ownership of the land.

The Institute and MAS-FAD & Co. jointly visited the NVRI, Outstation laboratory at Ikorodu Town on the 17th June, 2017. After the visit, the Institute management requested that the consulting Firm initiate the following and furnished the Institute with the necessary information:

- i. Carry out detailed evaluation of the level of encroachment by Lucky (Fibre Company and other illegal occupants).
- ii. Submit financial implication of professional service. The consulting Firms had forwarded the above information for further directive.

No. 1, Keffi Street, Obalende, South West, Ikoyi

The suit between Attorney General of the Federation and Attorney General of Lagos State over No. Keffi Street, Obalende South East, Ikoyi was amicably settled between the parties. The judgment as per Terms of Settlement was delivered on the 6th May, 2019. Execution of the Terms of Settlement are being complied to by the Parties.

TRAINING UNIT

The Training Unit in collaboration with the Training Committee recommends qualified staff for appropriate training in accordance with the Training Policy Guidelines for the Institute and Colleges. The Unit also processed the refund of school fees and other study leave allowances incurred by staff from the training on completion of study.

The Unit liaises with the Records Unit to maintain an update of staff on training.

The Unit processed the following for training in the year 2019 (Table 4)

Table 4. Number of staff and category of training approved

S/N	TYPE OF TRAINING	NUMBER OF STAFF
1.	PhD	6
2.	M.Sc	18
3.	HND	14
4.	ND	7
	Total	45

A total of 26 staff of the Institute resumed from study leave in 2019.

CHALLENGES

The major challenges facing the Training Unit are lack of computer and external drive for proper record keeping; also the lack of facilities for effective communication with staff on training and those intending to go on training.

SECURITY UNIT

The fundamental function of the Security Unit is the protection of lives and properties in and around the Institute. To achieve this, in addition to the internal security of the Institute, private guards (Pahek Security Services and the Executive Guards Limited) are on ground to complement security activities in the Institute. Further reinforcement is provided by the conventional police, Civil Defense Corps and the MOPOL (Mobile Policemen) all working in synergy to ensure the safety of lives and properties in and around the Institute.

During the period under review, the Unit provided adequate security for all categories of personalities visiting the Institute. The Unit also monitored the activities of students of the colleges and the Staff schools to prevent the breakdown law and order in the Institute.

Generally, the Institute witnessed peace during the year except for some few cases of theft and vandalization of electrical cables, stealing of laptops in some offices and other important installations within the Institute during the period under review. Efforts are on to identify and apprehend the culprits. The unit is requesting those who have usually information on the activities of hoodlums within the Institute to report same for further investigation and possible arrests.

Achievements

- Some of the culprits were caught and were prosecuted in the Court of Law.
- All visitors/students coming into the Institute were screened before coming in.
- Most vehicles are being checked before coming in and going out.
- Regular patrol in and around the Institute.

Constraints

- The incessant influx and encroachment of Fulani herdsmen and their cows into the Institute premises, despite several arrests and warnings
- Lack of sign posts in strategic places to prevent parking of vehicles in reserved areas
- Lack of enough tallies for effective monitoring of vehicles entering and exiting the Institute.
- Lack of security lightning in strategic places.
- Lack of prompt payment of the private guards to boost their morale.

- Lack of compliance to guidelines for proper and easy identification of staff of the Institute.
- The “Seven O Clock” gate need to be amended.
- The main gate needs to be modernized to provide shelter to the Security officer especially during the rainy season
- Inadequate communication gadgets.
- All the conveniences and most of the doors in the security office are bad.

Suggestions on the Way Forward:

- Dialogue with leaders (ArDOS) of the herdsmen to instruct their subjects to stay off the Institutes properties.
- More gate pass/tallies should be produced for use at the Unit.
- Security lightening should be installed at strategic location within the Institute and the colleges.
- Private Guards should be paid promptly if possible to boost their morale to be more dedicated to their duties.
- Staff of NVRI and the Colleges should always comply with rules and orders to assist the security men in discharging their duties.

LIBRARY AND DOCUMENTATION DIVISION

The importance of the library to the success of research and development cannot be over emphasized. This is because the library is the compendium of knowledge and provides the driving force for research and development. The activities of the library are tailored to meet the following mandates:

- i. To provide the research scientists access to the right information in the right form at the right time.
- ii. To establish a computerized information system for easy access to the information on animal health and production from all over the world.
- iii. To provide an opportunity for all states of the federation to access scientific information on the country's animal health and production activities.
- iv. To create and manage local databases on the country's animal health and production research activities.
- v. To provide extension workers nation- wide access to expert systems which cover a wide range of problems and solutions, to enable them transfer this knowledge to end-users.

To realize these goals and objectives the library is organized into four service points as follows:

THE SERIAL SECTION: This section maintained records of journals in the library. A total of 11 journal titles were received from donor agencies during the period under review. Furthermore, the section provided journal retrieval services on bibliographic queries to 317users.

THE CIRCULATION AND REFERENCE SECTION: The section is the end point of the library and it is designed to serve the clientele in the following services: charging and discharging of library materials, maintenance of inter- library cooperation, shelving and shelf reading, maintenance of statistical records of clientele. The section in 2019, attended to 1860 users comprising of both the Institute staff and users on referrals from universities and colleges of Agriculture whose research interests falls within the Institute's mandate.

TECHNICAL SECTION: This section is saddled with the responsibility of acquisition and processing of library materials both manually and electronically for easy access. During the year under review, 24 books were received as donations from national and international corporate bodies. In addition, three books were purchased by the Institute management. In total 57 new books were catalogued and classified.

E-LIBRARY: The networked world has had a profound impact on research, development and communication practice over the past decade. The establishment of the e- library in 2006 to augment the library resources on ground ensured that National Veterinary Research Institute was not left behind on this feat. Unfortunately, this feat could not be sustained due to non-replacement of faulty computers and internet services.

Achievements

- i. Twenty-seven titles were received. Three from the management and 24 as donation from local and international organizations.
- ii. Received 13 laptops from Nigerian Communication Commission (NCC) through the Management.
- iii. In July, 2019 5 staff of the library attended a sensitization workshop in the University of Jos organized by Librarians' Registration Council of Nigeria (LRCN). The aim was to create awareness, enlightenment and educate librarians of its activities across the north central geopolitical zones of Nigeria.

Challenges

- i. Low patronage of the library due to lack of new books, Journals and lack of internet service in the e-library.
- ii. Lack of functional computers in the e- library.
- iii. Lack of computers in the serial and circulation section for the second phase of the networking.
- iv. Lack of software maintenance- technical support.
- v. Break down of 3.0 kva UPS which disrupt process of retrospective conversion of library holdings.
- vi. Overall poor state of the physical structure of the library.
- vii. Inadequate tables and chairs for staff.

Future Plans

- i. To request for 15 desk top computers for the e-library for better information retrieval services:
- ii. More data bases to be subscribed to the library.
- iii. Complete digitization of library holdings.
- iv. Provision of internet services to the library

LIVESTOCK INVESTIGATION DIVISION (LID)

The activities of the Division are those of adaptation of exotic breeds of animals through cross breeding, provision of animals for vaccine production and research. The Division also engages in the production of improved pasture for livestock and feed formulation.

The LID is divided into several sections viz: Health, Dairy, Beef, Calves, Equine, Goat and Sheep production. Others are cultivation and pasture development, Feed-mill, Laboratory cattle and replacement, Farm Machinery and Agronomy, and Liquid Nitrogen. The Division is also responsible for Artificial Insemination (AI) activities in the Institute.

DAIRY SECTION

The section has the mandate to stock, select breed(s) or multiply dairy cattle as well as produce milk and milk products. It also serves as a research and teaching centre for students of the Federal College of Animal Health and Production Technology (FCAHP&T) and those on industrial training. The Section has a total of 50 animals (nine males and 41 females) of varying ages. A total of 8500 litres of milk was produced by the cows during the year under review. There were 18 births with eight deaths or culled.

ARTIFICIAL INSEMINATION (AI) SECTION

The section coordinates and oversee all the AI breeding programmes on the farm. Activities of the section includes; the management of exotic Friesian bulls and other cross bred bulls, collection of semen for processing, preservation and insemination. Currently, the Section has two 75% Friesian cross bulls being used to achieve its mandate.

Roles/Activities

- Improvement of indigenous breeds of cattle through artificial insemination with semen of Friesian breed processed at NVRI Vom for improved milk and meat production
- Manpower development in artificial insemination through capacity building.
- Semen collection, evaluation, processing and preservation.
- Herd health fertility check and selection of animals for planned breeding programmes

Achievements

- Maintenance and periodic assessment of preserve bovine frozen semen
- Herd health fertility check of all herds to determine their reproductive status
- Collection and evaluation of ram semen.
- Practical demonstration of AI techniques to farmers, undergraduate and/ postgraduate students on excursions, SIWES students and other visitors

LABORATORY CATTLE AND REPLACEMENT STOCK SECTION

The section is responsible for the maintenance and management of weaned calves to heifers and yearling bulls or bull calves and after wards transfer them to either dairy, beef or AI Sections accordingly.

There are 15 animals in the section; 11 females and 4 males (11 belonging to NVRI and 4 to FCAHP&T) that serves as breeding stock for the supply of young bulls to the bacterial vaccine production and also supply blood to other Divisions for research purposes. Routine activities in the section include; record keeping of animal in the herd, daily observation of animals to assess their health status and providing prophylactic and curative medication.

BEEF CATTLE PRODUCTION SECTION

The Section engages in the fattening of cattle for vaccine production through feedlot operation as well as the breeding of animals. It also selects animals with desirable traits for breeding to improve local stock. There are 35 animals (23 females and 12 males) in this section, 29 belonging to NVRI and six to FCAHP&T Vom.

PASTURE AND RANGE MANAGEMENT SECTION

The section is tasked with the management of pasture grasses and legume in the paddocks and designated fields. This involves the constant maintenance of stone fence, removal of unwanted weeds, destruction of ant hills, stumping, manure/fertilizer application, herbicide application and paddock reclamation. There is the need to expand the cultivation of some of the important pasture grasses and legumes such as Rhode grass, alfafa, lablab and cook stylo for improved pasture quality and income generation.

NUTRITION AND FEED MILL SECTION

This Section is saddled with the responsibility of formulation and production of feeds for various classes of animals on the farm. A total of 13341kg of feeds were produced out of which 13198kg were consumed by the animals in the various Sections during the period under review.

FARM MACHINERY AND FORAGE CONSERVATION SECTION

This Section is charged with the responsibility of preparation/cultivation of land for the production of pasture to be used for silage and hay. This is to ensure the constant supply of feeds for livestock especially during the dry season. The Section also renders maintenance, repairs and servicing of all farm tractors, implements and machineries. In addition, the Section render utility services with tractors and implements to other departments in the Institute. The section cultivated and mowed several hectares of land, bale and convey several tones of hay from the field to the stores and serviced farm machineries during the year under review.

HEALTH SECTION

This Section performs routine prophylactic procedures such as; de-worming of the herds in the farm, acaricide spraying or dipping of animals and annual vaccination of animals on the farm against haemorrhagic septicaemia, black quarter, contagious bovine pleuropneumonia, PPR, ASV, Hantavac and FMD. Several disease conditions such as babesiosis, dermatophilosis, helminthosis, pneumonia, mastitis etc. were diagnosed and appropriate treatments were instituted.

Challenges

The Division is faced with several challenges that militated against smooth operations. These challenges include but are not limited to;

- Lack of funds for purchase of necessary working materials in the various section of the farm
- Insecurity of lives and properties on the farm
- Encroachment and destruction of cultivated pasture by illegal grazers/herdsmen
- Lack of electricity on the farm affects farm operations and storage of semen
- Non availability of standard laboratory setting, equipment and offices for AI operation.
- Lack of pure breed Friesian bulls for stock upgrading
- Inadequate tractors and other farm machineries to effectively cultivate paddocks and designated pasture fields

Future plans

- Solicit for funds to procure and upgrade facilities on the farm for optimum performance
- Increase the number of security personnel on the farm to effectively man the facilities
- Timely procurement of feed ingredients for feed production
- Solicit for research grant to conduct research on following projects:
 1. Pregnancy rate (PR) of indigenous cattle following artificial insemination using Vom Cryopreserved semen and imported Cryopreserved semen.
 2. Fertility and hatchability trials of poultry eggs following artificial insemination.
 3. Fertility and seminal characteristics of Friesian bulls raised on the Jos Plateau.

PARASITOLOGY DIVISION

The Division is structured into sections and units with the overall aim of conducting research and diagnosis of economically important parasitic diseases of livestock in Nigeria and to formulate appropriate control measures in line with the mandate of the Institute. The Division during the year under review performed the following research and diagnostic activities outlined in this report.

PROTOZOOLOGY LABORATORY UNIT

The protozoology unit received, processed and examined a total of 401 blood and brain samples for the identification of blood parasites from various animal species across the country. From the number submitted, 63 were positive for various blood parasites (Table 1).

Table 1. Hemoparasite types detected in blood/ brain samples from various animal species

Animal species	No positive/ No of sample (%)	Parasite type identified
Cattle	42/138 (30.4)	<i>Babesia bigemina</i> , <i>B. bovis</i> , <i>Trypanasoma spp.</i> , <i>Anaplasma marginale</i>
Dog	9/46 (19.6)	<i>Babesia canis</i>
Goat	0/75 (0)	Nil
Horse	0/12 (0)	Nil
Sheep	12/126 (9.5)	<i>B. motasi</i> , <i>B. ovis</i>
Pig	0/04 (0)	Nil
Total	63/401 (15.7)	

HELMINTHOLOGY UNIT

For the detection of gastrointestinal parasites, a total of 493 fecal and intestinal samples were received for examination during the period under review. Samples were processed using the simple floatation and sedimentation techniques for the identification of various helminths and protozoan eggs and cysts. Overall, 228 of the samples were positive for various intestinal helminths and protozoan eggs and cysts (Table 2).

Table 2. Gastrointestinal parasites detected in samples submitted in 2019

Animal species	Type of sample	No positive/ No of sample (%)	Parasite type detected
Poultry	Intestine	173/372 (46.5)	<i>Ascaridia galli</i> , <i>Coccidia</i> oocysts, <i>Heterakis</i> spp., <i>Capillaria</i> spp.,
Cattle	Feces	16/43(37.2)	<i>Strongyle</i> eggs, <i>Eimeria</i> spp., <i>Monezia</i> , spp. <i>Haemonchus</i> spp., <i>Oesophagostomum radiatum</i> , <i>Fasciola</i> eggs, <i>Cooperia</i> , spp.,
Dog	Feces	4/10 (40.0)	<i>Taenia</i> spp., <i>Strongyloides</i> spp., Mite eggs
Goat	Feces	14/22(63.6)	<i>Eimeria</i> spp., <i>Haemonchus</i> spp.
Horse	Feces	0/2 (0)	<i>Strongyle</i> eggs, <i>Strongylus</i> spp.
Rabbit	Feces	11/17(64.7)	<i>Eimeria</i> spp., <i>Strongyle</i> eggs, <i>Hymenolopis</i> spp.
Sheep	Feces	5/15 (33.3)	<i>Strongyle</i> eggs, <i>Oesophagostomum</i> spp., <i>Haemonchus</i> spp.
Pig	Feces	5/12 (41.7)	<i>Eimeria</i> spp., <i>Strongyle</i> eggs
Total		228/493 (46.2)	

ENTOMOLOGY UNIT

Ectoparasites and skin infections remain a huge problem in livestock and pets in Nigeria. In an effort to curb the effects of these parasites, farmers submitted **175** samples which included ticks, flies, larvae and skin scrapings to the Entomology Unit. The samples were processed according to standard procedures for the identification of the ectoparasites. The findings are presented on Table 3.

Table 3. Ectoparasite types identified from animals

Animal species	Type of Sample	Number of samples	Ectoparasite type identified
Cattle	Ticks	28	<i>Amblyomma variegatum</i>
Dog	Ticks/Skin Scrapings	123	<i>Demodex canis</i>
Horse	Skin Scrapings	3	<i>Psoroptes</i> spp.
Sheep	Ticks/Flies/Larvae	21	<i>Rhipicephalus (Boophilus) species</i> , <i>Rh. sanguineous</i> , <i>Hyalomma truncatum</i> , <i>Oestrus ovis</i>
Total		175	

ETHNOVETERINARY RESEARCH AND PRODUCTION UNIT

The Division remains committed to the search for remedies to animal and human skin infections through alternative medicine approach. To this regard, research is ongoing to incorporate herbs into the chemical based product scabicur[®] which has been effective in the treatment of animal and human skin infections. In order to meet demand for the product, within the year under review, a total of 2,227 Scabicur[®] products comprising soap (1,530), ointment (344) and lotion

(353) were produced and supplied to the Consultancy Department of the Institute for sale to clients.

STUDENTS PROJECTS SUPERVISION AND SAMPLE ANALYSES

The Division provided bench space and supervised over ten student projects at various levels of academic pursuit (ND, HND, BSc., MSc. PhD) from different Universities, Polytechnics, Mono-technics in Nigeria. The staff of the Division provided the needed expertise and guidance to the students on sample analysis, interpretation of results and report writing.

Challenges

Under listed are some of the problems that mitigate against the optimal performance of research, diagnostic and production activities in the Division

1. Inadequate and irregular water supply to the laboratories
2. Lack of funds for research
3. Inability to install some new equipment/faulty and malfunction of new equipment (water distiller, ELISA reader etc)
4. Lack of a functional PCR machine, and gel documentation system in the Molecular parasitology lab
5. Inadequate light microscopes, dissecting microscopes
6. Lack of a photomicroscope deter our efforts to document and photograph rare and important parasites for teaching and publication purposes

Way Forward

The Division hopes to explore several avenues to improve on her performance in the future. These include but not limited to:

- a) Seek for external grants to bolster research activities in the Division
- b) Establish collaborations with Universities and Research Institutes for research on areas of mutual interest
- c) Obtain NAFDAC registration for Scabicur® products
- d) Train and retraining of staff on grantsmanship and other relevant areas of Research and Development (R&D).
- e) Seek for research funding from the Institute to conduct research on the development of attenuated coccidian vaccine

PLANNING DIVISION

The Division serves as the Databank of the Institute. It is saddled with the responsibility of coordinating, formulating, monitoring and evaluation of the Institute’s projects and programmes.

Specific Activities

Data Bank Unit

The following figures show bacterial and viral vaccines production as well as vaccine demand and supply charts and graphs.

Fig. 1: Type and doses of bacterial vaccines produced in 2019

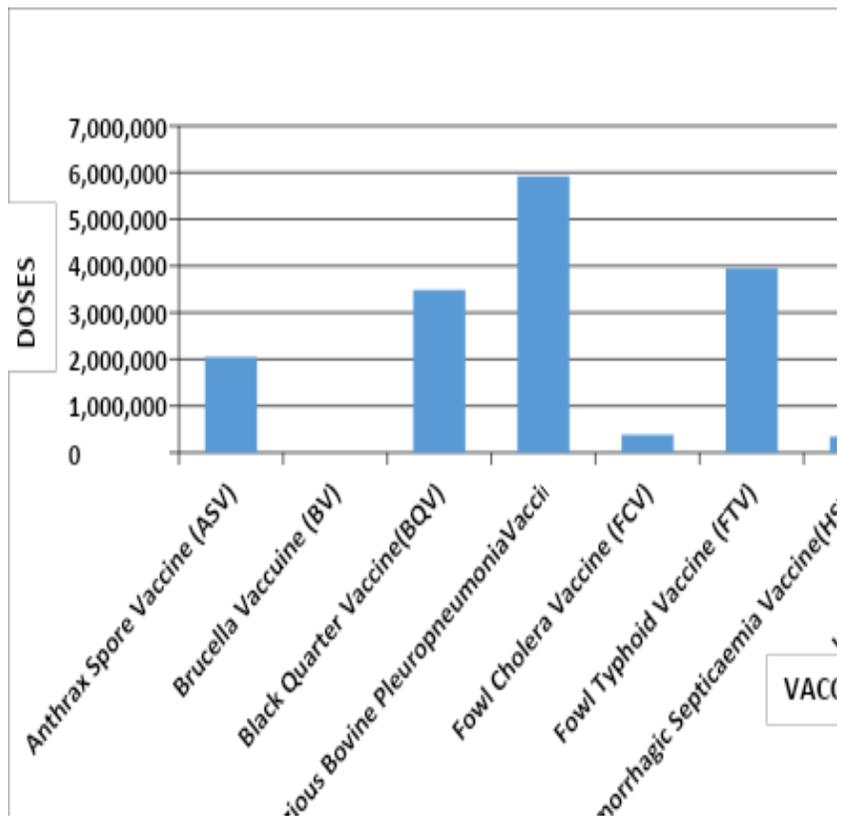


Fig. 2: Types and doses of viral vaccine Produced in 2019

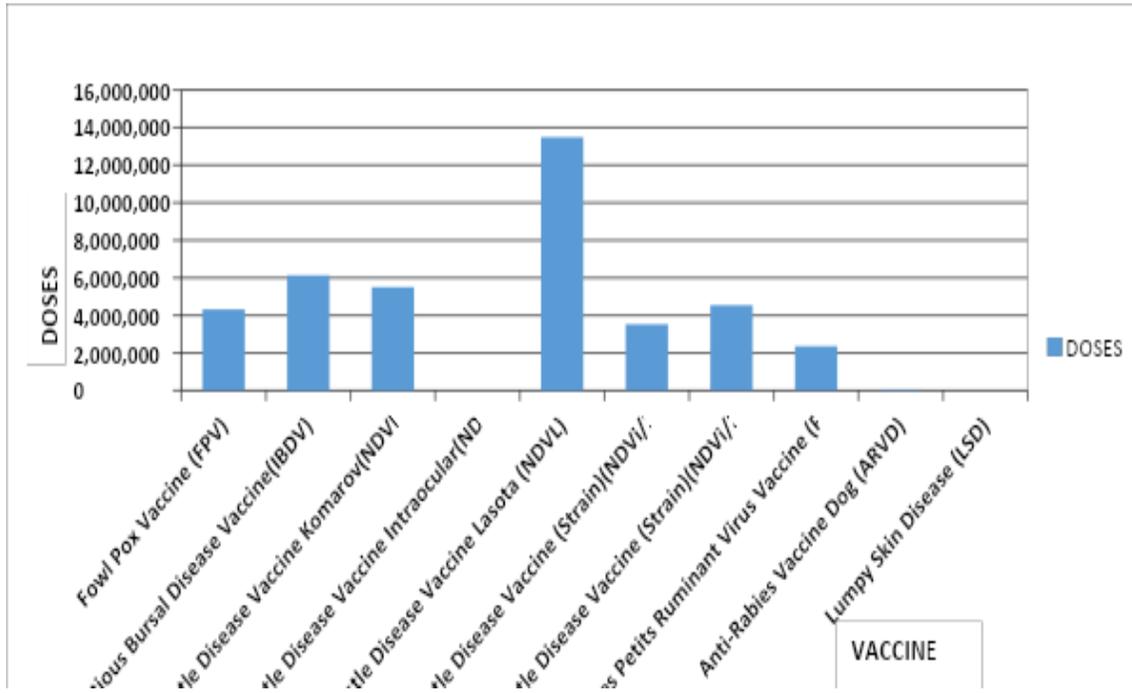
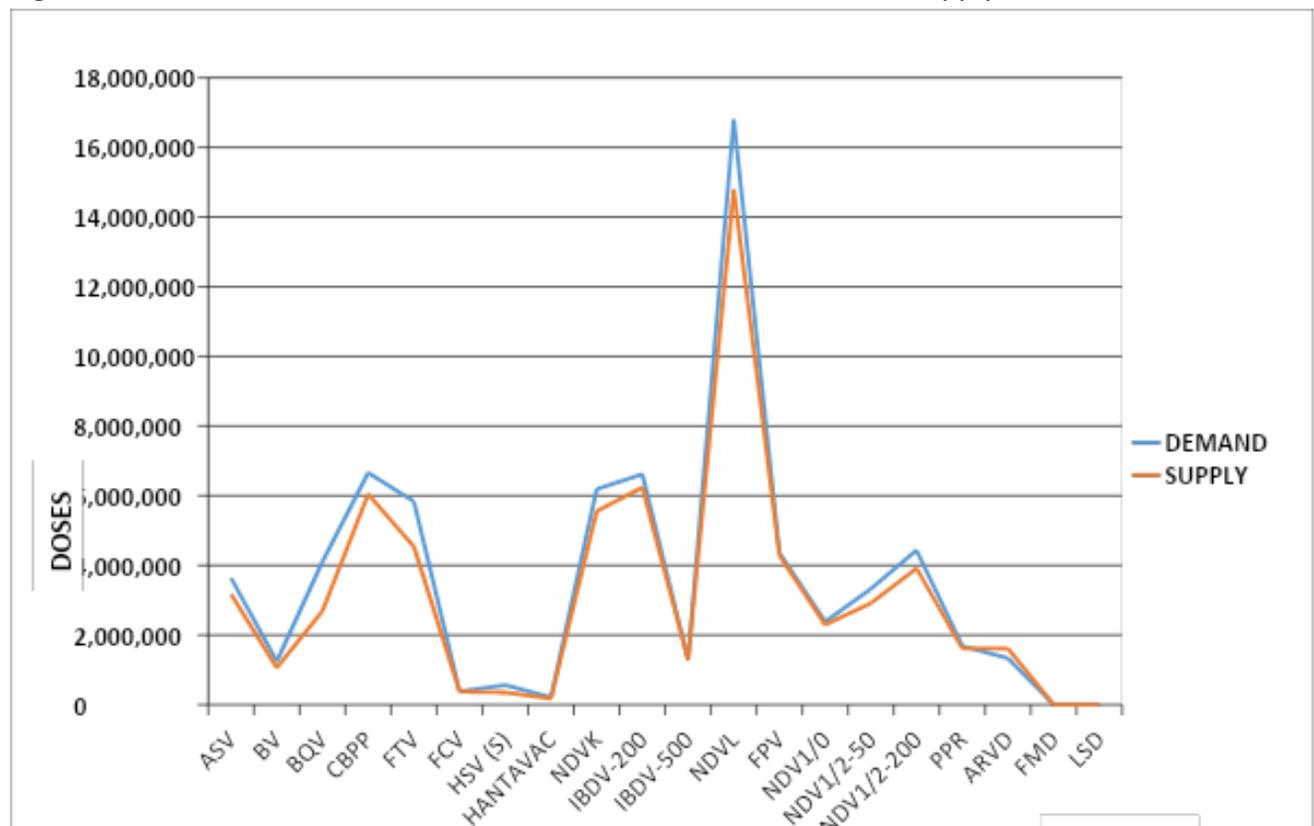


Fig 3: Bacterial vaccine demand and supply in 2019.



Planning Unit

The skills gap/ SWOT analysis for all Departments and Divisions was conducted. The results were forwarded and accepted by Management for further deliberation. About 493 staff identification cards were reprinted as a result of changes in cadre, or the replacement of loss ID cards.

Information and Audio Visual Unit

The Unit was able to make available packaged publications on the Institutes activities to participants from National Institute of Policy and Strategic Studies (NIPSS) and other guests. The Audio Visual Unit was able to capture and document all major events in the Institute such as courtesy visits, seminars and clinical conferences. Assorted banners for NVRI programmes were also printed by the Unit.

Monitoring and Evaluation Unit

The Unit monitors the Institute’s projects and identifies indicators that play important roles for impact driven projects.

Land Unit

The inspection of properties of the Institute was carried out. Properties include; the Triangular land, John Chaha shopping complex, NVRI Quarters Hwolshe, Shekarau close Bukuru low cost, plot 699 Bukuru low cost, No. 3a Chaha road, E70 Baba Quarters, John Chaha supermarket, NYSC lodge K/ Vom behind John Chaha supermarket, K/Vom Quarters Barna, and Vwang GRA.

Challenges

- a. Inadequate office space for staff.
- b. Difficulty in collecting data from other Divisions and on time.
- d. No basic training for Monitoring and Evaluation staff.

Future Plans

1. To redesign the Institute identification cards with security features
2. To redesign the database using relevant software to capture and establish an effective information system by deploying online real time.
3. To have a good planning and organisational skill with a strong focus on attention to details quality and high performance.

POULTRY DIVISION

FUNCTIONS /MANDATE OF THE DIVISION

1. To produce fertile eggs for the production of various poultry vaccines.
2. To produce chicks for vaccine testing and research purposes.
3. Investigate diseases of poultry that may hamper productivity
4. Investigate nutritional and management aspects of all classes of poultry and their effects on disease management
5. Introduction, adaptation and disease management of exotic breeds of poultry.
6. Research on production and health of poultry generally.
7. Teaching of students from FCAH&PT, other colleges and universities.

SPECIFIC ACTIVITIES IN THE YEAR

1. Production of fertile eggs /birds for Vaccines Production and Research.
2. NVRI/GCL Collaborative research projects on production parameters.
3. Production of birds for research (Ducks, Guinea fowls, Quails, Black bantam, etc.)
4. Seminars/Publication.
5. Training students on industrial attachment.
6. Supervision of students projects from FCAHPT Vom.

Achievements

- 1) Practical training on Artificial Insemination in Chickens and Turkeys
- 2) Birds were hatched and raised as replacement for spent birds in the vaccine birds section.
- 3) Fertile eggs were continuously supplied to the vaccine production laboratories for vaccine production.
- 4) Eggs were incubated routinely for the research and quality control laboratories.
- 5) Collaborative research work with Grand Cereal Limited on feed trials in the farm is ongoing.
- 6) Increase in production of the introduced varieties of chicken breeds (Nacked Neck, FUNAAB Alpha, Frizzle feather, Tiv Ecotype, Fulani Ecotype) into the farm.
- 7) Quails and other species of birds with their eggs were produced in the farm.
- 8) Hatching of quails and other exotic birds for under graduate and post graduate research.
- 9) Provision of fertile eggs for postgraduate research.

PROJECT SUPERVISION/RESEARCH ACTIVITIES

1. Effect of varying levels of Ginger (*Zingiber officinale*) on the haematological and biochemical parameters of layer chickens

2. Effect of varying levels of turmeric (*Curcuma longa*) on the haematological and biochemical parameters of spent layer chickens
3. Effect of sex – sorting on growth performance of broiler chickens.
4. Effect of water deprivation on growth performance of broiler chickens in Vom Jos South L.G.A of Plateau State.

HEALTH SECTION

In this years’ review, the health section recorded significant achievement in areas of;

- Improved methods of early and accurate diagnosis of common poultry diseases.
- Research into the use of locally sourced ethno -veterinary products for the control and treatment of common poultry diseases.
- Research into new methods of prophylaxis for control of common poultry diseases.

During this period, we recorded **48** different disease outbreak comprising of Viral (14), Bacteria (32), and protozoa diseases (2).

Table 1: Diseases recorded in birds in the Poultry Division in 2019

S/No	Disease	Numbers Affected	Percentage
1	Newcastle Disease	10	20.8
2	Salmonellosis	23	47.9
3	Coccidiosis	2	4.1
4	Collibacillosis	9	18.75
5	Chronic Respiratory Disease	1	2.0
6	Infectious Bursal Disease	3	6.2
	TOTAL	48	99.75

EGG PRODUCTION AND UTILIZATION

Table 2. Vaccine birds egg production and disposal in 2019

Month	Total Production	Broken	Hatched	Virology	B/factory	DEA	Infertile	Dead embryo
Jan	71,475	8,438	11,437	870	34,860	15,870	830	892
Feb	69,326	7,633	-	10,860	39,870	1,230	962	530
March	76,976	8,916	5,000	26,130	32,100	4,830	1,537	2,239
April	69,067	6,215	-	12,287	48,000	2,565	730	2,794
May	64,656	13,531	-	2,000	42,150	6,975	210	201
June	62,092	11,045	3,667	16,030	22,860	8,490	851	1,964
July	63,585	8,169	1,080	21,706	29,490	3,140	1,432	2,330
August	71,622	9,580	4,000	23,560	25,590	8,892	2,432	2,766
Sept	62,351	3,691	2,000	26,570	28,950	1,140	2,324	3,193
Oct	52,183	6,626	2,338	28,391	13,320	1,508	2,229	3,085
Nov	66,222	11,666	3,840	23,776	17,220	9,720	1,893	2,987
Dec	50,428	8,928	-	1,150	36,060	4,290	308	208
Total	779,983	93,393	33,362	193,330	370,470	68,650	15,738	20,423

Table 3. Vaccine eggs supplied to Production and Research Laboratories 2019

MONTH	NDV	IBDV	AI	QC	V/R	FPV	RES	ARV
Jan	-	-	450	420	300	-	-	-
Feb	3,000	1,140	-	210	210	3,000	-	3,000
March	17,500	-	-	210	420	4,000	-	4,000
April	7,000	-	-	360	-	2,000	77	3,000
May	-	-	450	150	-	-	504	1,000
June	10,500	-	750	420	-	3,000	360	1,000
July	16,146	-	1,200	-	-	4,000	360	-
August	14,500	-	1,350	210	-	6,000	-	1,500
Sept	14,210	600	2,550	210	-	5,500	-	3,500
Oct	16,571	1,800	2,400	-	-	5,500	210	2,000
Nov	12,840	1,800	3,000	510	-	4,916	-	2,000
Dec	-	-	150	-	-	-	-	1,000
Total	112,267	8,340	12,300	2,700	930	37,916	1,511	22,000

Keys: NDV – New Castle Disease Vaccine; IBDV – Infectious Bursal Disease Vaccine, AI – Avian Influenza, QC – Quality Control, VR – Viral Research, FPV – Fowl Pox Vaccine, RES – Research, ARV – Anti- Rabies Vaccine

Table 4. Egg production from other species of birds in 2019

Month	Quails A	Quails B	BB	NN	Ful	Tiv	FA	FF	Geese	Ducks	Tuk	GF
Jan	12,713	26,551	121	44	120	90	106	44	17	137	13	-
Feb	4,153	28,019	49	22	102	37	90	18	5	142	15	-
Mar	8,142	25,726	165	9	106	92	27	2	7	162	45	93
April	7,654	28,187	194	-	108	68	-	-	9	187	30	283
May	6,591	26,898	169	-	159	119	-	-	6	269	41	270
June	6,361	23,125	217	-	172	163	35	-	-	237	23	874
July	9,575	23,084	232	-	213	176	58	-	-	268	10	870
Aug	7,921	22,423	191	-	217	224	100	2	3	281	17	647
Sept	10,692	26,945	270	17	79	86	66	40	21	314	28	453
Oct	7,932	23,121	129	22	123	72	42	54	20	282	41	191
Nov	5,960	13,391	164	9	128	163	19	21	27	296	20	-
Dec	2,066	15,813	235	6	180	105	24	8	24	490	2	-
Total	89,760	283,283	2,136	129	1,707	1,395	567	189	139	3,065	285	3,681

Keys: BB – Black Bantam, NN – Naked Neck, Ful – Fulani, FA – FUNAAB Alpha, FF – Frizzle Feather, Tuk – Turkey, GF – Guinea Fowl

Challenges

1. Incomplete repairs on the dilapidated hatchery damaged by rainstorm.
2. Old and obsolete incubators that need urgent replacement.
3. Lack of mini Poultry processing plant.
4. Dilapidated administrative block/staff offices.
5. Inadequate staff strength (junior).
6. Frequent fluctuations in voltage of electricity leading to spoilage of equipment and gadgets.

Future Plans

1. To commence the production of broiler turkeys for table meat

PRINTING AND PUBLICATION DIVISION

Introduction

The printing and Publication Division was established as a Service Department of the Institute, to meet its numerous printing requirements. Since inception in 1988, the Division had the mandate to:

- Handle all the printing requirements of the Institute
- Formulate new concept, design, code and printing of all the Institute's vaccine labels.
- Publish/print all scientific and technical documents for internal and external distribution.

Therefore, the Division actively engages in the design and printing of the following items:

- Vaccine Labels
- Scientific Journals
- Official sales invoices
- Official receipts
- Yearly calendar
- Official headed papers, envelopes and file jackets
- Examination answers booklets for the colleges etc.
- Annual Report booklets

Routine Activities

The following vaccine labels (type and quantity) were produced during the year under review.

NDV (Komarov)	-	15,480 pieces
IBDV	-	19,180 pieces
NDV-I2	-	77,224 pieces
NDV (lasota)	-	136,306 pieces
Fwol typhiod	-	26,345 pieces
CBPP	-	59,500 pieces
NDV intra ocular	-	4,130 pieces
PPR	-	33,280pieces
ASV	-	4,455pieces
FPV	-	22,560 pieces
FCV	-	1,509 pieces
HSV	-	8,887 pieces
Hantavac	-	6,499 pieces
ARV	-	49,351 pieces
Brucella	-	12,000 pieces
BQV	-	7,545 pieces

Other items produced during the year include;

ED/CEO Complementary cards	-	900 pieces
ED/CEO headed paper	-	7,000 copies
NVRI Official File	-	3,000copies
Official letter headed paper	-	2,500 copies
APPER FORMS	-	3,000 copies
Attendance Register	-	150 books

Constraints

- Shortage of Technical staff
- Lack of modern printing equipment
- Renovation /creation of additional offices through partition
- Creation of an independent entry (Exit) into the division
- Creation of toilet convenience for the division

Future Plan

At the moment, there are several printing technologies evolving with benefits and value. The division will want to pursue a printing technology that will best suit the need of the Institute in these modern times where exciting quality products of good standard will be produced. The technology will also include the protection of the Institute's numerous brands and other benefits such as:

- i. Revenue generation; the technology will serve the Institute and customers with similar needs
- ii. Speed and efficiency; usually, long production process is cut short and saves time.
- iii. Producing at the cheapest price possible will attract more customers
- iv. Deliver goods of the right quality and quantity at the right time, and at the right price.
- v. It motivates and boost the morale of staff

In this regard the Division is appealing to the Institute management to procure a modern printing machine that we enable us to commence the printing of synthetic vaccine labels as compared to other non-tire able water proof labels.

The Division is equally requesting the Institute to accord the staff of the Printing Press to attend conferences, Book Fairs and International Printing Exhibitions. These specialized meetings feature live display of the various printing technologies from different companies from all over the world and provide the option to choose a printing technology that best suits the Institute's printing need especially the vaccine label.

QUALITY CONTROL DIVISION

The Quality Control Division of the National Veterinary Research Institute has been mandated to ensure the implementation of quality management system for the production of veterinary vaccines, biological and general laboratory procedures in the Institute to meet international standards. As such, quality control tests were conducted on the NVRI produced vaccines to ensure that they have been appropriately prepared, packaged, labelled and stored. Further tests to determine the purity, sterility, viability, safety, potency and absence of foreign bodies were carried out to ascertain that vaccines are suitable for field use. Periodic assessment and auditing of all the institutes laboratories were performed to ensure Good Laboratory Practice commensurate to international standards.

Routine activities

Vaccine Quality checks

A total of 78 vaccines batches produced by the Institute were subjected to internal quality checks in the Division. These include 33 batches of bacterial vaccines and 45 viral vaccines. Breakdown of the bacterial vaccines tested is as follows: Five batches each of Anthrax spore vaccine (ASV) and Black quarter vaccine (BQV), four batches each of Contagious Bovine Pleuro-pneumonia vaccines (CBPPV), Fowl Cholera vaccine (FCV) and HantaVac. Others are Fowl Typhoid vaccine (3 batches) and eight batches of Haemorrhagic septicemia vaccine (HSV).

Of the 45 batches of Viral vaccines tested, 10 were Newcastle disease Lasota (NDVL), 9- Newcastle disease Intra-ocular (50 doses), 8- Peste des petit ruminants (PPRV), 6- Anti rabies vaccine (ARV), 4- Newcastle disease Kamorov (NDVK), 2- Newcastle disease Intra-ocular (200 doses of NDV_{I2}) and 3 each of Fowl pox vaccine (FPV) and Infectious Bursal Disease vaccine (IBDV).

PANVAC VACCINES QUALITY CHECKS

In compliance with ISO 9001:2015 guidelines on international standardization of vaccines, ten batches of both bacterial and viral vaccines produced in the Institute were sent to the Pan Africa Veterinary Vaccine Centre (PANVAC), DebreZeit, Ethiopia for Quality Control Test and Certification. These vaccines include; Contagious Bovine Pleuro Pneumonia Vaccine (CBPPV): batch 01/2019(20 vials), Newcastle Disease Vaccine Intra-ocular (NDV-I₂):batch 01/2019[50 dose] (20 vials), Newcastle Disease Vaccine Intra-ocular (NDV-I₂):batch 01/2019[200dose] (20 vials), Newcastle Disease Vaccine Intra-ocular (NDV-I₂): batch 02/2019[200 doses] (20 vials), Newcastle Disease Vaccine Lasota (NDV-L):batch 01/2019(20 vials), Fowl Typhoid Vaccine (FTV): batch 01/2019(20 vials), Haemorrhagic Septicaemia Vaccine (HSV):batch 01/2019,Haemorrhagic Septicaemia Vaccine (HSV): batch 02/2019(10 bottles), Haemorrhagic

Septicaemia Vaccine (HSV): batch 03/2019 (10 bottles), Black Quarter Vaccine(BAV): batch 01/2019(10 bottles). The vaccines were certified suitable for field use.

Achievements

Vaccines Quality checks

- i.The Division successfully tested 33 batches of bacterial vaccines and 43 batches of viral vaccines.
- ii.Renovation of the isolation/inoculation room (UV room) was carried out. The experimental animal house for the rearing of birds for potency and challenge studies was renovated and demarcated for various vaccine tests.
- iii.The renovation and demarcation of the large animal experimental house for potency and challenge studies is on-going

Challenges

1. **Lack of critical equipment:** The Division lacks the following vital equipment: Moisture analyzer, incubators, Biosafety cabinets, functional water distiller, refrigerators and deep freezers
2. **Reagents and Media:** Delay in the supply, insufficient or lack of some reagents, chemicals and media constitutes a challenges to the effective discharge of our duties. A list of our requirement had been submitted to the management via the Procurement Committee.
3. **Manpower:** The Division needs more personnel in the following cadre to handle our laboratory works and maintaining the experimental animal house
 - Animal Scientist
 - Laboratory Technicians and Assistants
 - Animal Health Attendants
3. **Office space:** There is inadequate office spaces for staff of the Division, which negatively affects the effective performance of routine duties.
4. **Shortage of running water:** There is shortage of water supply in the Division and this has affected the performance of routine activities in our laboratories.
5. **Defects in the laboratory windows:** The windows to the laboratories do not close very well due to some construction/installation defects. Consequently, dust from the environment enters the laboratory leading to the contamination of our experiments/setups.
6. **Non Functional air conditioning systems:** The air conditioning systems in the offices and laboratories are not functioning and need to be repaired so as to provide a better and conducive working environment for the staff

7. **Cracks on the floors of the laboratories:** There is a side to side floor crack in the laboratory that seems to be enlarging gradually over the years. This has been reported to the Institute Engineers/Workshop but there has not been any action taken to remedy the situation so far.

Future Plan

1. The Division plans to establish a collaboration with the Biotechnology Division to conduct molecular identification and characterization of vaccine antigens in line with the current OIE requirement.
2. Provision of vital reagents, Test kits, chemicals, media, laboratory wears and wares
3. Explore avenues or signing of a memorandum of understanding (MoU) with a reputable courier service provider to ease the dispatch of vaccines and other biologicals routinely carried out by the Division.
4. Repairs or purchase of Biosafety cabinets to minimize contaminations during laboratory procedures.
5. The sealing of all laboratory windows and the provision of functional air conditioners to make the laboratory conducive, less prone to contamination and protect the equipment compressors.
6. Provision of regular flow of clean water in the laboratory
7. Provision of adequate and good office spaces for staff of the Division

RABIES DIAGNOSIS AND RESEARCH DIVISION

Rabies Laboratory is charged with the following mandates: -

- i. Conduct research on rabies and rabies-related viruses.
- ii. Confirmatory laboratory diagnosis of animal rabies infections caused by rabies and rabies-related *Lyssaviruses*, using *in vitro* and *in vivo* methods
- iii. Development and production of rabies antigens and antisera for research and diagnosis.
- iv. Assessment of the antigenicity of rabies vaccine and vaccine viruses by *in vitro* and *in vivo* methods
- v. Clinical trials and field evaluation of NVRI rabies vaccines and sero-monitoring of vaccinated dogs
- vi. Participation in national surveillance of rabies and rabies-related viruses
- vii. Participation in rabies proficiency test administered annually by the Nancy laboratory for rabies and wildlife, France, alongside other reputable laboratories in the world
- viii. Training/capacity building of personnel.

Notable Activities

Laboratory Diagnosis

A total of 207 specimens from six (8) animal species (dogs, cats, sheep, bat, cattle, donkeys, pigs, and monkeys) were received and tested by the Direct Fluorescent Antibody Test (DFAT), for rabies diagnosis. In some cases, the mouse inoculation test (MIT) was used as backup to the DFAT. Of these numbers, 192 (92.8 %) were from domestic dog, 3 (1.4%) from cat, 4 (1.9%) from livestock (cattle, sheep and pig), 5 (2.4%) from horses, 2 (1.0%) from wildlife (monkeys) and 1 (0.5%) from a bat. A total of 135 (65.2%) of all samples submitted were confirmed positive, with 129 (96.4%) of them being from dogs (Table 1).

Table 1. Distribution of samples received and tested for rabies confirmatory diagnosis using the DFAT.

S/No.	State	Dog		Cat		Cattle		Equine		Sheep		Monkey		Pig		Bat		Total
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1.	Plateau	102	57	2	1	-	-	1	-	-	2	1	-	-	1	-	1	168
2.	Kano	4	-	-	-	-	1	1	2	-	-	-	-	-	-	-	-	8
3.	Kaduna	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
4.	Bauchi	6	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	8
5.	Rivers	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
6.	Kebbi	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	3
7.	Abia	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
8.	Benue	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
9.	Zamfara	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
10.	Ebonyi	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
11.	Bayelsa	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
12.	Kwara	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
13.	FCT	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
14.	Nasarawa	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
TOTAL		129	63	2	1	-	1	2	3	-	2	2	-	-	1	-	1	207

- Key: + – Positive, – Negative

Human anti-rabies pre- and post-exposure prophylaxis: The Division facilitated administration of human anti-rabies pre- and post-exposure prophylaxis to some staff of the Institute who were categorized as “high risk group” or exposed to the virus (Table 2).

Table 2. Distribution of high risk NVRI staff vaccinated against rabies in 2019.

S/No.	Division	no. of persons vaccinated	no. of doses
1	Livestock investigation	8	8
2	Rabies Diagnosis and Research	3	3
3	Quality Control	15	45
Total		26	56

Research

The process of raising rabies hyper-immune serum in rabbits for research, diagnosis and possible future commercial scale, which commenced in 2017 is in progress.

iv) Research collaboration/Bench work activities

The laboratory hosted two postgraduate (PhD) students, one each from the Ahmadu Bello University Zaria and University of Nigeria, Nsukka. Their research on the detection of rabies virus antigen in dog brain samples by fluorescent antibody test (DFAT) and/or isolation of rabies virus by mouse inoculation test (MIT) is in progress. Two HND students from the Federal College of Animal Health and Production Technology, Vom were also hosted for their research projects during the period under review.

Challenges

A. Non-availability of the following equipment:

- i. Biosafety cabinet class II
- ii. Ultra-Low freezer (-80°C)
- iii. Refrigerated centrifuge (+4°C)
- iv. Carbon dioxide (CO₂) incubator (+37°C)
- v. pH meter

B. Non-availability of panel of monoclonal antibody to Nigerian isolates of rabies virus

Future Plans

- i. To replace the MIT with rabies tissue culture isolation test (RTCIT) using BHK cell line for isolation of rabies and related viruses, in order to conform to international standards; hence the need for the first three equipment listed above.
- ii. Seek the Institute's approval for funds to acquire panel of monoclonal antibody (MAb) to Nigerian isolates of the rabies virus. This is meant for antigenic typing of available rabies and related virus isolates in the archive of laboratory.
- iii. Submission of proposal to the institute on a survey of rabies and/or related viruses in bats, rodents and wildlife that are incriminated in the epidemiology of rabies in Nigeria.
- iv. Resubmission of concept note to the Institute on the "Assessment of Immunogenicity of NVRI low egg passage (LEP) flurry dog rabies vaccine against circulating strains of rabies virus in domestic dogs in Nigeria".

GENERAL SERVICES DIVISION (STORES)

INTRODUCTION

The Stores Division ensures uninterrupted flow of working materials to the production and services departments of the Institute thereby contributing to the attainment of the Institute’s mandate.

The Central Store is made up of the following sections; Drugs, Chemicals & Reagents, Glass Wares, Expendable and Non–Expendable and Consumable, Vaccine Dispatch, and Receiving Stores Sections. Others are Workshop and Maintenance, Dagwom Farm, LID, Furniture, Ledger and Scrap Stores Units.

MAIN STORES

During the year under review, the Unit carried out the following activities: -

- (a) Received and kept all incoming expendables, non- expendables, consumables, glass- wares, drugs, chemicals and reagents supplies of the Institute and releases same for use by all the appropriate Divisions.
- (b) Ensured the proper documentation of all material records and their physical correctness.
- (c) Continuous reconciliation of the record of all stockable items in shelves, bin cards, fridges, cupboards, bulk stores, warehouse, containers and the cold room.
- (d) Ensured that all items released are back up by approved stores transferred vouchers (STR).
- (e) Ensured the posting of receipts, issues and costing of material using (FIFO) and material valuation.

The main store has a stock in hand worth ₦ **811,927,053.82** consisting of the under listed:

i.e.	Drugs, Chemicals and Reagents (EE)	= 179,214,958.21
	Glass wares (FF).....		= 151,342,051.53
	Consumables (I)		= 93,121,174.64
	Expendables (GG)		= 359,211,862.03
	Non- Expendables (II).....		<u>=29,037,007.42</u>
	TOTAL		₦ <u>811,927,053.83</u>

VACCINE DESPATCH SECTION

Vaccine Type	BALANCE B/F		RECEIPTS		ISSUES		BALANCE C/F	
	Vials/bottles	Doses	Vials/bottle s	Doses	Vials/bottle s	Doses	Vials/bottles	Doses
PPR – 50	-	-	33,051	1,652,550	27,138	1,356,900	5,913	295,560
ARVD – 1	11,523	11,523	50,335	50,335	38,331	38,331	23,527	23,527
NDVI/O – 200	-	-	11,462	2,292,400	11,462	2,292,400	-	-
NDV ½ -50	635	31,750	57,669	2,883,450	58,304	2,915,600	-	-
NDV ½ 200	-	-	22,573	4,514,600	22,573	4,514,600	-	-
NDVL – 200	-	-	77,673	15,534,600	77,637	15,534,600	-	-
NDVL – 500	-	-	-	-	-	-	-	-
NDVK – 200	4,846	969,200	22,267	4,453,400	27,113	5,422,600	-	-
NDVK – 500	-	-	-	-	-	-	-	-
FPV – 200	-	-	21,398	4,279,600	17,397	3,479,400	4,001	800,200
FPV – 500	-	-	-	-	-	-	-	-
IBDV – 200	2,886	577,200	30,469	6,093,800	32,759	6551,800	597	119,200
IBDV – 500	3,654	1,827,000	-	-	2,700	1,350.00	954	477,000
LSD -500	-	-	-	-	-	-	-	-
FTV – 100	1	100	41,111	4,111,100	41,112	4,111,200	-	-
BSV – 200	-	-	11,278	1,127,800	11,100	1,110,000	178	17,800
CBPPV – 100	-	-	63,144	6,314,400	62,873	6,287,300	271	27,100
FCV – 200	164	32,800	1,762	352,400	1,702	340,400	224	44,800
HSV – 40	2	80	9,855	394,200	8,978	359,120	879	35,160
HANTAVAC - 40	-	-	4,567	182,680	4,567	182,680	-	-
BQV – 500	813	406,500	6,793	3,396,500	6,560	3,280,000	1,046	523,000
ASV – 400	-	-	5,873	2,349,200	5,782	2,312,800	91	36,400

RECEIVING SECTION

The receiving section is charged with the responsibility of taking delivery, sorting, inspection and processing for payments, all consignments receive from suppliers and process deliveries and transferred to the respective stores for onward documentation, storage and issue. During the period under consideration, stock worth **₦ 591,191,533.55** was received from suppliers as presented on the table below.

2019 ANNUAL REPORT NVRI VOM

S/N	Description	1 st quarter (₦)	2 nd quarter (₦)	3 rd quarter (₦)	4 th quarter (₦)	Total (₦)
1.	Diesel	15,060,000.00	15,795,000.00	23,400,000.00	11,800.00	66,055,000.00
2.	Generator		-	-	198,200.00	198,200.00
3.	Feeds/Concentrate	6,727,465.00	9,311,321.00	-	-	16,038,786.00
4.	Grains	1,471,927.25	12,290,000.00	-	2,400,000	16,161,927.25
5.	Environmental/Maintenance	225,000.00	-	-	-	225,000.00
6.	Lab., Chem., Drugs & Reagents	1,733,676.00	88,860,229.91	-	-	90,593,905.91
7.	Office Equipment	21,420,386.78	7,020,000.20	-	-	28,440,386.98
8.	Cooking Gas	870,000.00	451,000.00	-	-	1,321,000.00
9.	Laboratory Equipment	8,593,806.33	305,970,341.88	22,801,717.91	-	337,365,866.12
10.	Sports Equipment	-	1,840,650.00	-	-	1,840,650.00
11.	Printing Press/Stationeries	2,197,627.5		-	16,827,273.79	19,024,901.29
12.	Electrical Equipment	-	4,833,120.00	-	199,000.00	5,032,120.00
13.	Laboratory Consumables	363,290.00	-	-	-	363,290.00
14.	Plumbing Equipment	86,000.00	-	100,000.00	-	186,000.00
15.	Poultry Equipment	-		4,410,000.00	-	4,410,000.00
16.	LID Fertilizers	-	2,496,000.00	-	-	2,496,000.00
17.	Laboratory Wears	-	-	-	2,205,000.00	2,205,000.00
18.	Automobiles	-	-	-	41,574,000.00	41,574,000.00
19.	Containers	-	-	1,438,500.00		1,438,500.00
20.	TOTAL	58,749,178.86	449,855,162.99	27,762,717.91	19,624,473.79	591,191,533.55

WORKSHOP/MAINTENANCE SECTION (DIESEL)

Diesel Summary

Details	Number of Liters	
Balance B/F	12,199	
Supplies	277,660	
Adjustments	8,725	
Total available	298,584	
Less Total Issue	264,284	
Closing Bal.	34,300	
Details	Quantity in Liters	Values (₦)
Generator Workshop	194,124	53,419,140
Diagnostic Furnace	6,500	1,885,000
Poultry	28,800	7,866,000
Bacterial Boiler	13,600	3,689,800
Dagwom Farm	5,720	1,575,200
Water Tank	3,740	1,031,800
LID	7,480	2,088,200
BS LAB 3	3,000	855,000
VIP	1,320	378,000
Total	264,284	72,788,540.00

MAINTENANCE SUMMARY

- | | | |
|--------------------|---|---------------|
| 1. Plumbing | - | ₦2,488,096.00 |
| 2. Roofing sheets- | | ₦72,000.00 |

LEDGER/DOCUMENTATION SECTION

The Ledger/Documentation comprises of the following sub-units; Ledger, Plants and Security Document. During the year under review, the unit carried out the following tasks:

- Received all incoming store receives (SRV) vouchers (SIV) and store issue vouchers for non-expendables, consumables, glass-wares; drugs, chemicals and reagents, plants, furniture and its documentation.
- Ensured the posting of receipts, issues and costing of materials.
- Kept receipts and other security documents for the Institute which are issued to Accounts and other Departments on request after approved application.

Challenges

- Despite the formation of Procurement Committee, decentralize purchases is still being witnessed. This procedure makes documentation difficult.
- The Stores Division is still not I.T compliant hence our routine activities are still being carried out on a manual basis. This has led to delayed reports and service delivery.
- Lack of renovation of the Stores house has made ventilation/storage space difficult.
- The Stores house is chocked up with outdated or obsolete materials/items (Expendables, Consumables and Glassware).
- The Store house is also chocked up with slow moving items and some expired Drugs, Chemicals and Reagent.
- The Vaccine cold room needs constant maintenance.
- Lack of protective clothing.
- Lack of bulk purchase of stocks hinders activity in the Institute.
- Lack of Junior staff (store).

Way Forward

1. Need for store staff to be trained in the use of store software and other FGN ICT compliance.
2. Need for the purchase of store handling equipment.
3. The Stores houses are in a dilapidated condition and calls for urgent rehabilitation of the store houses and Offices for Job performance.
4. Diesel surface tank needs to be re-enforced as against rainy season.
5. A regular maintenance of cold room machines.
6. To carry out quarterly inventory in the Institute.
7. Coding of all Institute assets should be undertaken.

VETERINARY EXTENSION AND RESEARCH LIAISON SERVICES DIVISION

The Division carries out all the extension activities of the Institute. It packages technologies released from the Research Divisions for dissemination to livestock and poultry farmers in the country. Questions from farmers are addressed and disseminated using the appropriate media for others to benefit.

The Division liaises with the state Agricultural Development Projects (ADPs) for effective dissemination of information and obtaining feedback. The Agricultural Development Officers from State Ministries of Agriculture (ADPs) are mainly extension outfit meant to address farmers' constraints. Feedback is often from farmers for researchers.

Extension activities are executed through:

- OFAR (On-Farm-Adaptive-Research Trials)
- Monthly technology review meetings (MTRM)
- Zonal Steering committee and Zonal technical committee meetings
- Surveys (thematic and general)
- Training workshops, Open days, and seminars
- Publications (print and electronic)
- Representing the Institute at Agricultural shows and Trade fairs

Specific (notable) activities

- Production of NVRI monthly Newsletters (NVRI Bulletin)
- Staff of the Division attended/participated in:
 - Security meeting organized by Federal College of Animal Health & Production Technology and the Nigeria Police Force
 - Training on Standard Operating Procedure by Quality Control Division
- Training of Community Animal Health Workers from Nasarawa state from June 16th-30th in collaboration with International Committee of Red Cross (ICRC).
- Development of Grant Proposal on E-Extension project for Propcom Mai-karfi, via NVRI Consultancy. The proposal successfully scaled through the different stages and the project commenced in the last quarter of 2019
- Hosting of and participation in the last quarter Zonal Steering committee (ZSC) meeting held at NVRI Vom on 12th to 13th November 2019. ADPs from different states in the North Central region attended the meeting. In the meeting, problems affecting farmers in the region were discussed, and the coordinating research Institute (NCRI Bedeggi) promised to address the problems by contacting the appropriate Research Institutes, so that they will proffer solutions to the problems
- A baseline survey was carried out from 16th December 2019, in Bauchi, Yobe, Kano, Taraba, Borno, and Gombe to establish the disease bench mark. Questionnaires were

administered to animal health workers and veterinarians. This was sponsored by Propcom Maikarfi under digitalization of veterinary extension grant.

- Ten staff from NVRI Vom attended the World food day which was organized by Federal Ministry Agriculture on 16th October 2019 in Abuja. The Institute (NVRI) showcased her technologies and many secondary school students, livestock and poultry farmers visited our stand.
- National Agricultural show took place on 14th to 18th October 2019 at Abuja and 10 staff of NVRI Vom represented the Institute at the show. A lot of individuals including executives of ARCN visited NVRI stand and interacted with our staff on the technologies being showcased.

Achievements

- Training of 25 Community Animal Health Workers from Nasarawa state in collaboration with International Committee Red Cross.
- Profiles of staff were collated using the SON Protocol
- The Division in collaboration with NVRI Consultancy won a grant from Propcom Markafi for digitalization of extension services in the nine Propcom states which are Adamawa, Bauchi, Borno, Gombe, Kano, Kaduna, Jigawa, Taraba Yobe
- Successful commencement of base line study of common diseases of cattle, sheep, goats, poultry, pigs and camels in some selected states in northern Nigeria. This is the first phase of the E-extension project sponsored by Propcom Markafi
- Successful hosting of Zonal Steering committee meeting was held at NVRI Vom on 12th to 13th November 2019,
- Approval by Head of service to upgrade the Division to a full- fledged department.

Challenges

- Lack of a dedicated vehicle for extension activities
- Insufficient office space for staff

Future plan

- To build the two newly created Divisions
- To train staff on modern extension methods and activities

VIRAL RESEARCH DIVISION

In line with the mandate of the Institute, the Division engages in research and development activities geared towards the diagnosis, treatment, control or eradication of economically important viral diseases of animals in Nigeria. Therefore, based on feedback from and demands among livestock and poultry farmers the following projects were conducted by the Division during the period under review. They include; the development of a single live capripox vaccine for sheep and goats and production of a live Lumpy skin disease (LSD) vaccine. Other are; diagnosis of viral skin diseases (lumpy skin disease, Goat pox, Sheep pox, Orf and Bovine Papilloma) and some respiratory (Peste des Petits Ruminants) and gastrointestinal (canine distemper virus) viral infections of animals. The Division also conducted a national surveillance for PPR and Canine distemper and provided training for students on SIWES and Fellowship program of the College of Veterinary Surgeons Nigeria (CVSN).

SPECIFIC (NOTABLE) ACTIVITIES

Vaccination of Dairy animals using the NVRI developed Lumpy Skin disease vaccine

- Over 300 dairy cattle belonging to Integrated Dairy Farm were vaccinated with the NVRI developed LSD vaccine. The animals were being monitored for seroconversion.

Laboratory Diagnosis

- Samples were received from suspected outbreaks of viral skin infection from Plateau, Kano, Kaduna, Bauchi, Akwa Ibom, Borno and Yobe States. The samples were analyzed accordingly and the results are presented on table 1.

Table 1. Sample analyzed by Polymerase Chain Reaction (PCR) for various viral skin infections

Disease	No. of samples received	No. tested	No. positive
Lumpy skin Disease	36	14	12
Goatpox	0	0	0
Orf	9	1	1
Bovine Papiloma	4	0	0
Total	49	15	13

The Division also received samples from all states of the Federation for the diagnosis of PPR and CDV. The samples were analyzed using Polymerase Chain Reaction (PCR) and Enzyme Linked Immunosorbent Assay (ELISA) and the results are shown on Table 2.

Table 2. Molecular and serological diagnosis of PPR and Canine Distemper

Disease	Sample type	Total	PCR			ELISA		
			No. tested	Positive	Negative	No. tested	Positive	Negative
PPR	Tissues	41	41	9	32	-	-	-
	Swabs	95	95	21	74	-	-	-
	Sera	131	-	-	-	131	60	71
CDV	Urine	1	-	-	-	1	-	1
TOTAL		268	136	30	106	132	60	72

Challenges

- Broken down water bath, ultralow freezer, - 20°C freezers.
- Faulty UPS, ELISA plate washer and reader
- Nonfunctional CO₂ Incubator
- Lack of regents and other consumables for conventional PCR and ELISA for all diseases (PPR, CDV, LSD, GTP etc)
- Lack of viable cell lines, medium and serum for isolation, Vaccine production and titration for PPR, CDV, LSD, GTP etc.
- Lack of funds to for investigation of several outbreaks of viral skin diseases and PPR in Nigeria
- Irregular water supply in the laboratory make it difficult to maintain hygiene and sanitation
- Lack of lighting (bulbs)in the laboratories and offices.

Future Plan

1. Research to determine bacteria commonly associated with PPR suspected outbreaks in Nigeria
2. Research to determine PPR vaccine antibody decay
3. Production of LSD vaccines
4. Development and production of diagnostic kits using local antigen and antiserum for basic serological tests.
5. Intensify passive surveillance and investigation of field outbreaks of Newcastle and Infectious bursal disease viruses.

VIRAL VACCINES PRODUCTION DIVISION

Introduction

The Division has a primary responsibility of producing vaccines for the prevention of livestock and poultry viral diseases of economic and/or public health importance in Nigeria and other West African countries. In addition, the Division produces distilled water, cell cultures and media for use by the other Divisions in the institute. Furthermore, the Freeze Drying and Labeling Sections domiciled in this Division render services to other Divisions involved in the production of lyophilized vaccines and other biologics.

The Viral Vaccine Production Division produces the following veterinary viral vaccines:

- Infectious Bursal Disease Vaccine or IBDV (Gumboro)
- Fowl Pox vaccine (FPV)
- Newcastle disease vaccine (La Sota)
- Newcastle disease vaccine (Hitchner B1-Intra-ocular)
- Newcastle disease vaccine (Komarov)
- Thermotolerant Newcastle disease vaccine (NDV I-2)
- Peste des Petits Ruminants (PPR) vaccine
- Rabies vaccine for dogs (ARV)
- Lumpy Skin disease (LSD) vaccine
- Sterile diluents for vaccines

PRODUCTION

The Division produced over **47 million** doses of the various veterinary viral vaccines to meet up with market demands. A summary of vaccine production for the year 2019 are presented in Tables 1.

The Division also produced about **3000** litres of distilled and MilliQ water for its use and that of other Divisions in the Institute. Various cell culture media (GMEM, DMEM, EMEM, RPMI, F-12, HBSS) and cell cultures in monolayer and suspension including Vero R133, ZZR 2, CHS-20 and BHK-21. These cell lines were used for research in various Divisions of the Institute and the two colleges as well for Quality Control purposes. A culture bank of these same cells are being maintained in liquid nitrogen in the Division

The Freeze Drying Section also freeze dried lyophilized vaccine of the Division and Contagious Bovine Pleuropneumonia (CBPP) vaccine, Fowl Typhoid Vaccine (FTV), and Brucella vaccines for the Bacterial Vaccine Production Division for sale to livestock farmers.

Table 1. Summary of viral vaccines production figure (January - Dec 2019)

S/No.	VACCINE	VIALS PRODUCED	DOSES PRODUCED
1.	ARV	54,998	54,998
2.	FPV 200 doses	21,611	4,322,200
3.	IBDV 200 doses	30,688	6,137,600
4.	IBDV 500 doses	0	0
5.	NDV I2 50 doses	70,550	3,527,500
6.	NDV I2 200 doses	22,719	4,543,800
7.	NDV-K 200 doses	27,601	5,520,200
8.	NDV-L 200 doses	67,436	13,487,200
9.	PPRV	47,255	9,451,000
10.	LSD	0	0
	TOTAL	342,858	47,044,498

NOTABLE ACTIVITIES

- Repair and utilization of five (5) faulty autoclaves
- Repairs and the use of a faulty GT 40 Lyovac Freeze Dryer
- Installation of a brand new 10,000 capacity fully automated egg incubator
- Repair of the faulty Newmann Labelling Machine
- Procurement and installation of a new Chiller for LyoFast 7 Boc Edward Freeze Dryer to replace the faulty chiller
- Repair/reactivation of the faulty -20°C vaccine storage cold room
- Provision of a dedicated water supply for the autoclaves.

Challenges

- Poor quality fertile eggs for vaccine production
- Delay in supply of critical reagents for vaccine
- Frequent breakdown of the Lyovac GT 40 Freeze Dryer
- Breakdown of the old Chiller for the LyoFast 7 Boc Edward Freeze Dryer
- Unavailability of potent master seed for vaccine production to increase vaccine dosages and titres.

Future Plan

- Increase dose/vial of critical vaccines in order to drive down cost of vaccines and compete favorably in the market
- Resuscitation of roller machines for the increased production of cells to boost the production of cell culture-based vaccines
- Development of cell culture based anti-Rabies and Fowl pox vaccine.

STAFF PUBLICATIONS IN PEER REVIEW JOURNALS

- Adedeji A.J., Dashe Y., Akanbi O.B., Woma, T.Y. Jambol, A.R, Adole A.J., Bolajoko, M.B., Chima, N., Asala O., Tekki I.S., Luka P and Philip Okewole. (2019). Co-infection of Peste des petits ruminants and goatpox in a mixed flock of sheep and goats in Kanam, North Central Nigeria. *Veterinary Medicine and Science*. DOI: 10.1002/vms3.170
- Adedeji A.J. Mölle, J., Meseko C.A., Adol J., Tekki I.S., Shamak D. & Hoffman B. (2019). Molecular characterization of Capripox viruses obtained from field outbreaks in Nigeria between 2000- 2016. *Transboundary and Emerging diseases* 1–11. <https://doi.org/10.1111/tbed.13197>
- Ifende, V.I., Maurice, N.A., Abbas Y., Agu C., Bolajoko, M.B., Jambol A., Adole J.A., Asala O., Wungak Y.S., Maguda A., Umeh E., & Adedeji A.J. (2019). A retrospective study of viral skin diseases of cattle, sheep and goats in Plateau State, Nigeria. *Sokoto Journal of Veterinary Sciences* 17(1): 49-55
- Shittu I. Adedeji A. J., Luka, P. D., Asala, O.O. & Sati, N. M., Nwagbo, I.O., Chinyere, C., Arowolo, O.A., Adole, J. A., Emennaa, P., Abdu, P.A. and Joannis, T. M. (2019). Avian leukosis virus subgroup– J as a contaminant in live commercially available poultry vaccines distributed in Nigeria. *Biologicals* 57: 29–33
- Bolajoko M.B, Adedeji A. J., Dashe G.D., Osemeke O. H . and Luka P.D (2019). Epidemiology and Economic impact of goat pox on small holder small ruminant farmers in Kanam Local Government Area, Plateau State, Nigeria. *Small Ruminant Research*.
- Samuel E Mantip, David Shamaki, Souabou Farougou (2019). Peste des petits ruminants in Africa: Meta-analysis of the virus isolation in molecular epidemiology studies. *Onderstepoort Journal of Veterinary Research* 86(1), a1677. <https://di.org/10.4102>
- Talatu P. Markus, Jibril Adamu, Haruna M. Kazeem, Olushola S. Olaolu & Timothy Y. Woma (2019). Assessment of Peste des petits ruminants antibodies in vaccinated pregnant Kano brown does from Nigeria and subsequent maternal immunity in their kids. *Small Ruminant Research* 174: 53 – 56.
- Odita Cl., IS Tekki, DG Moses, JI Barde, KO Egwu, SE Idachaba, JS Ahmed, VI Ifende, O Makanju, DA Ugbe, PN Zhakom, E Nzekwe, N Watsamanda, G Okpala, Y Dashe, C Nwosuh, PA Okewole and D Shamaki (2019). Dog anti-rabies vaccination coverage in Jos South LGA of Plateau State, Nigeria. *Sokoto journal of veterinary sciences*, 17(3):30-34.

- Issa A Muraina, Jurbe G Gotep, James T Tanko, ThankGod E Onyiche, et al (2019). Anticoccidial effects of *Khaya senegalensis* aqueous stem bark extract on broiler chickens experimentally infected with Eimeria species. Springer Nature, Tropical Animal Health and Production. <https://doi.org/10.1007/s11250-019-02125-4>.
- Dawurung, C.J., Gotep, J.G., Usman, J.G., Elisha, I.L., Lombin, L.H., Pyne, S.G. (2019). Antidiarrheal Activity of Some Selected Nigerian Plants Used in Traditional Medicine, Pharmacognosy Research, 11(4): 371-377.
- Kamani, J., Alicia Rojas, E. Msheliza, M. Shand, S. Harrus, and G. Baneth (2019). Molecular detection of filarioid worms in dogs in Nigeria, West Africa. Veterinarski Arhiv. 89 (6), 821-830., DOI: 10.24099/vet.arhiv.0282
- Weka, PR., Kamani, J., Cogan, T., Eisler, M., Morgan, ER (2019) Overview of *Taenia solium* cysticercosis in West Africa. Acta Tropica 190: 329–338

BOOK/BOOK CHAPTER

- Meseko CA, Makanju Olabisi, Ehizibolo David and Muraina Issa (2019). Book Chapter on: Veterinary pharmaceuticals and antimicrobial resistance in developing countries [Online First], IntechOpen, DOI: 10.5772/intechopen.84888 (IntechOpen Ltd, UK. Pp 1-20). Available from: <https://www.intechopen.com/online-first/veterinary-pharmaceuticals-and-antimicrobial-resistance-in-developing-countries>

CONFERENCE PAPERS

- Woma T. Y. et al (2019). Isolation and full genome sequences of two co-circulating lineages of peste des petits ruminants viruses from Nigeria. 56th Nigerian Veterinary Conference, Reverton Hotels, Lokoja, Kogi State. P. 125.
- Amoche J., Meseko, C. A., Ugbe, A. D. & Shamaki, D. (2019). Investigation of deaths of African vultures in the environs of National Veterinary Research Institute, Vom, 56th Nigerian Veterinary Conference, Reverton Hotels, Lokoja, Kogi State. P. 160.
- Amoche J., Adedeji, A., Bitiyong, R; Dyek, Y; Osemeke, H; Maurice, Nanven Abraham & Luka, P (2019). Outbreak of sheep pox in flocks of sheep and goats in Maiduguri, Borno state, Nigeria, 56th Nigerian Veterinary Conference, Reverton Hotels, Lokoja, Kogi State. P. 146
- Weka R., Adedeji A.J., Barde I.J. Jambol A. R., Ifende V.I., Gyang H.L., Nyam D.C., Tizhe

E.V., Maurice N. A. & Luka P. (2019). Molecular and histopathological identification of *Taenia solium* metacestodes in slaughtered pigs in three states of North Central Nigeria, 56th Nigerian Veterinary Conference, Reverton Hotels, Lokoja, Kogi State. P. 154

Ishaya I. Tekki (2019). Samples for Rabies diagnosis, storage and transportation to laboratory. Presented at African Centre of Excellence in Neglected Tropical Diseases and Forensic Biotechnology (ACENTDFB) Hands-On Training Workshop on Rabies Surveillance and Control Workshop, Ahmadu Bello University Zaria. Date; April 1st– 5th.

Tekki, I.S., S.E. Hambolu, O.A. Olabisi, D.G. Bwala, P.A. Okewole, D. Shamaki. (2019). NVRI'S roles in rabies control in Nigeria; availability, accessibility and type of vaccine produced. Presented at African Centre of Excellence in Neglected Tropical Diseases and Forensic Biotechnology (ACENTDFB) Hands-On Training Workshop On rabies surveillance and control Workshop, Ahmadu Bello University Zaria. Date; April 1st – 5th.

Tekki, I.S., B.A. Onoja, A.O. Faneye, I. Shittu, G.N. Odaibo and O.D. Olaleye (2019). Laboratory investigation of fatal rabies in a 5-year boy bitten by a dog in Ibadan, Nigeria. Presented at 56th Annual National Congress of Nigeria Veterinary Medical Association, held at Lokoja, Kogi State.

Tekki I.S., S.E. Hambolu; K.C. Anyika; U.A. Rayyanu; M. Oguche; N.O. Akanni; P. Luka; F. Obishakin; D.G. Moses; J.S. Ahmed; I.J. Barde; N.A. Dachin; C.J. Livinus; R.A. Haruna; P.N. Lombin; Y.D. Dashe; P.A. Okewole; D. Shamaki (2019). Devastating economic losses in a livestock farm due to rabid wildlife invasion in North Central Nigeria. Presented at the 6th International Conference on Rabies in West Africa (RIWA), Theme: "Actualizing One-Health Collaboration Towards a People Without Rabies by 2030". Held at the ECOWAS Commission Abuja, Nigeria. Date; 19-24 August, 2019.