



GUYANA LIVESTOCK DEVELOPMENT AUTHORITY

ANNUAL REPORT 2018



Guyana Livestock Development Authority Annual Report 2018

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LIST OF ACRONYMS

AGP-	Animal Genetic Programme
AI-	Artificial Insemination
ASS-	Artificial Support Services
COM-	Commercial Feed
DWG-	Daily Weight Gain
ETS-	Embryo Transplant Services
FAO-	Food and Agriculture Organisation of the United Nations
Gog-	Government of Guyana
GLDA-	Guyana Livestock Development Authority
GNBS-	Guyana National Bureau of Standards
GSA-	Guyana School of Agriculture
HPAI-	Highly Pathogenic Avian Influenza
IDB-	Inter- Development Bank
IICA-	Inter-American Institute for Cooperation on Agriculture
LSF-	Livestock Farm
MoA-	Ministry of Agriculture
M&E-	Monitoring and Evaluation
MUB-	Molasses Urea Block
OIE-	The World Organization for Animal Health
PAHO/WHO-	Pan American Health Organization/ World Health Organization
UWI-	University of the West Indies
VPHU-	Veterinary Public Health Unit
VSL-	Veterinary Services Laboratory
WMRB-	Wheat Middling Rice Bran

EXECUTIVE SUMMARY

The year 2018 could be considered a successful year for the Authority and is evident by substantial achievements of set targets. The animal health programme would have examined 15 activity areas of which 13 had an achievement percentage of 80 to 100 percent, while the other two areas achieved 76 and 53 percent of target.

A total of 547 import permits were granted in 2018, a 61.8% increase over 2017 figures. The permits were issued for the importation of canine, veterinary supplies and hatching eggs (broiler), this increase could be attributed to an aggressive campaign of the Authority to alert and sensitive the general public about the services offered by the GLDA. Therefore, as a result of improved collaboration with Customs and improve vigilance five canine and 12 fighting cocks that did not meet the requirements for imports or were illegally imported were intercepted.

Additional quarantine staff were placed at critical areas, in an effort to strengthen vigilance in our bordering regions. We now have staff located at the International Crossing Lethem, Region. 9 and in the latter part of 2018, new quarantine staff were employed for placement in Regions 1 and 2.

We would have introduced in 2018, the inter-regional permit book, this introduction was done to better regulate the internal movement of animal and animal products, it is envisaged to reduce the likelihood of disease transfer/spread as a result of animal movement within Guyana.

The Bovine TB surveillance and control programme was enhanced through greater collaboration with the Georgetown Municipal Abattoir and the Environmental Health Officers in the regions. GLDA has enhanced its participation of the Food Safety Committee resulting in better data collection. As a consequence of the improved surveillance activities, 48 positive case of postmortem Tuberculosis were detected at the Georgetown Municipal Abattoir and at abattoir in Region 7.

The Guyana's Animal Disease Surveillance plan was successfully finalized through workshop and discussion with other stakeholders. This document will guide the development of surveillance system and would result in timely interventions geared at protecting the gains in our livestock industry.

As a response to reports of an occurrence of a vesicular disease in Venezuela at an area close to Guyana's border, GLDA mounted a preventative response that included surveillance and monitoring of border crossings in Region 1, public awareness campaigns that included the print and electronic media, printing and distribution of sensitization posters and discussions with local residents, law enforcement, customs and regional management officials, all formed part of the strategy to ensure that Guyana remain free of any notifiable disease.

Perhaps the highlight of the year pertaining to veterinary services was the fact that for the first time we took part in a rabies inter-laboratory proficiency testing at our Veterinary Services Laboratory using the DFA technique with samples sent from Mexico. We were able to correctly determine 9 out of 10 sample sent to us.

Two members of staff of the GLDA presented research papers at the National Agricultural Research and Extension Institute, Research Conference, this small but significant step is one we must feel a sense of pride about as it is the first time in the history in the GLDA that our staff members were able to address out peers on scientific livestock work undertaken in Guyana.

There were significant increases in all livestock production parameters when compared to 2017, these increases include a 37 percent with respect to poultry, a 7 % increase with respect to beef and a 10% increase with respect to table eggs and a 23% increase for pork. These increases could be attributed to two especial reasons, one being our ability to harness information as well as our improved extension services being supplied to the farming communities.

During the reporting year our large ruminant section at Ebini, the herd grew, by a total of 142 animals, which was tabulated to be 1.89 % growth from the calves born during the breeding season.

ANIMAL HEALTH UNIT

Policy Statements Veterinary Services

GLDA will operate a competent and efficient Veterinary Service so as to prevent and control the effect of economically important animal diseases, zoonotic diseases, and to safe-guard the safety of food originating from animals.

GOAL OF THE AHU:

To develop and maintain an animal health system and support service that adequately address issues of animal health, livestock traceability, disease diagnosis, food safety and animal welfare in keeping with OIE standards.

OBJECTIVES OF THE AHU:

- To provide efficient and effective veterinary intervention with a view of preventing the occurrence of diseases
- To ensure that the human population is protected through an efficient zoonotic disease control programme.
- To maintain and enhance the productivity of animals, while providing timely and accurate information on the health status of livestock.

ANIMAL HEALTH PROGRAMME 2018

The Animal Health Unit has structured the Animal Health programme to focus on development in below stated key areas. It is envisaged that successful implementation of the activities within these areas will result in the enhancement of the animal health system, the outcome being improved production and productivity, improved food-safety and enhanced farmers' livelihood.

- Epidemiology/surveillance and monitoring.
- Quarantine, inspection and certification.
- Veterinary diagnostic and laboratory support services.
- Disease control, monitoring and eradication.
- Species specific animal health planning and sustainable livestock productivity.

EXTRACTS OF PLANNED ACTIVITIES/EXPECTED OUTPUT

- Conduct Foot and Mouth Disease (FMD) simulation exercise aimed at testing Guyana's preparedness and validating disease preparedness manuals.
- During the course of 2018 continued clinical surveillance programme for HPAI and other poultry diseases, FMD, Botulism.
- By November 2018 expanded sero-surveillance programme to determine the presence/absence and spread of diseases in poultry (Infectious bursal disease, Newcastle disease, Mareks disease) in Regions 1, 2 and 7, duck (Duck Viral Hepatitis, Duck Viral Enteritis) in Regions 2,3,4 5,6, and swine diseases (Porcine Reproductive and Respiratory Syndrome, Porcine Endemic Diarrhoea),toxoplasmosis in Region 1 – 10.
- By December 2018 improved the capacity of the histopathology department in specimen preparation and storage.
- During the course of 2018 received and processed 3,100 assorted samples with a focus of timely and accurate diagnosis.
- During the course of 2018 expanded and strengthened disease prevention and control for endemic diseases (Rabies, Botulism, Black leg) in Regions 1,2 3, 9, by the use of vaccination.
- Worked with 20 farmers in each administrative region – (Five each of poultry, swine, small ruminants and cattle), to improve the overall management situation of their animals and farms with a view of improving production and productivity.

- Conducted a minimum of 12 farm visits per week per veterinary officer promoting good animal health practices and addressing other issues of farmers.
- Conduct by December 2018 a total of 40 farmers' training activity of an animal health nature with the aim of training 600 farmers in Regions 1,2,4,5,6,7,9, and 10.

TABLE 1: KEY TARGETS

ACTIVITY	EXPECTED TARGETS
Bovine Rabies Vaccination	1500 heads
Botulism vaccination	5000 heads
FMD Simulation Exercise	1
Poultry Disease testing	800 birds
Granting of Import Permits	90% of requests granted
Import/Export Certification	90% of requests granted
Processing of samples VSL	3100 samples
Abattoir surveillance visits	3000 visits
Testing for Bovine Tuberculosis	500 heads
Farmers training	40 training activity 600 farmers trained
Farm visits	18,200 visits

TABLE 2: TARGETS AND ACHIEVEMENTS 2018

ACTIVITIES	TARGET/EXPECTED OUTPUT	ACHIEVEMENT	% OF TARGET ACHIEVED
- Conduct bio-security measures at ports of entry (disinfection)	... Vehicles – 121,000 People – 125,000	Vehicles – 92,362 People – 138,707	.. 76.3 % ... 111 %
- Import and export certification	. Import /export certification ... 90% . Granting animal imports license ...90%	.	See attachment for details
DISEASE CONTROL, MONITORING AND ERADICATION			
- Vaccination of at-risk animals against endemic diseases ... Rabies Botulism & Blackleg ... Equine encephalitis	.1500 heads of cattle in Reg. 2, 3 & 9 ...5000 heads in Reg. 9 .. outbreak response	...2,653 animals ...4,600 animals ... 54 animals	Approx. 176.9% ...92% .. No target
- Vampire bat reduction programme	.10 bat control activities	.15 activities (trapping and treatment of bite wounds).	...150%
EPIDEMIOLOGY/SURVEILLANCE AND MONITORING			
- Bovine Tuberculosis (BTB) testing	.500 of animal population tested for BTB	.. 398 animals were tested as part of a targeted surveillance activity	...79.6%
- Brucellosis testing.	. Test based on needs	...560 animals tested	...No target set

- Abattoir Surveillance for TB	.. 3,000 visits3,093 visits	...103.1%
- Poultry disease Surveillance visits (Hatchery, farms)	... 40 hatchery visits ... 1000 visit on avian disease surveillance ... 800 blood samples	...37 Visits to hatcheries ...1448 visits on HPAI surveillance to farms ... 429 blood samples collected	... 92.5% 144.8% .. 53.6%
- FMD surveillance 800 blood samples tested	... 922 blood samples tested	.. 115.3%
- Laboratory diagnostic support (Veterinary Services Laboratory)	.. 3,100 sample processed	.. 3,635 assorted samples processed.	.. 117.3%
- Training of farmers in various aspects of disease identification and control	.40 training activity 600 farmers trained in disease management	...68 training activity 1063 farmers trained	.170% of training, 177.2 % farmers
- Farm visits	.. 18,200 visits	...17,429 visits	...95.8%
- Ambulatory service	.. 71,200 animals treated	...67,542 animal treated	...94.9%

Table 3: COMPARISON OF SELECTED ACHIEVEMENTS 2017 and 2018

ACTIVITIES	ACHIEVEMENTS 2017	ACHIEVEMENT 2018	CHANGE
- Conduct bio-security measures at ports of entry (disinfection)	. Vehicles- 123,856 .. People- 145,849	Vehicles – 92,362 People - 138,707	.. 25.4% decrease ... 4.9 % decrease
- Import and export certification	- Issuing of import permits;	See attachment	There has been an overall increase compared to 2018
- Vaccination of at-risk animal against endemic diseases	.. 2,426 heads of bovine vaccinated against Rabies ...5,671 animals vaccinated against Botulism and blackleg	...2,653 animals vaccinated against Rabies ...4,600 animals vaccinated against Botulism and blackleg	...9.4% increase in rabies vaccination .. 18.9% decrease in number of animal vaccinated
- Vampire bat reduction programme	.. Fifteen (15) bat control activities	.15 activities focus on bat trapping and treatment of bite wounds.	.. No change

- Bovine Tuberculosis (BTB) and Brucellosis testing and control.	.. 1,799 animals were tested for TB as part of a targeted surveillance activity ...1,029 animals tested for Brucellosis	.. 398 animals were tested for TB as part of a targeted surveillance activity ...560 animals tested for Brucellosis	.77.9% decrease .. 45.6% decrease
- Laboratory diagnostic support	.. 3,497 samples processed	.. 3,635 assorted samples processed.	3.9% increase
Poultry disease Surveillance	.. 1,306 visits on HPAI surveillance to farms .. 792 samples for New Castle and HPAI in poultry .. 1,029 animals tested for Brucellosis	.1,448 visits on HPAI surveillance visits .. 429 samples for New Castle and HPAI in poultry .560 animals tested for Brucellosis	.. 10.9% increase .. 45.8% decrease .45.6% decrease
- Training of farmers in various aspects of disease identification and control	.. 840 farmers trained in 54 training activities	...1063 farmers trained in 68 training activities	Approximately 26.5% & 25.9% increase respectively
- Farm visits - Ambulatory service - Riverine service	...18,155 visits ...57,193 animal treated ... 7,787 animals treated	...17,429 visits ...67,542 animal treated ... 7,032 animals treated	.4% decrease .. 18.1% increase .9.7% decrease

ANALYSIS OF ACHIEVEMENTS (Success/failure)

GENERAL COMMENTS

The year 2018 could be considered a successful year for the unit and is evident by substantial achievements of set targets. There were 15 activity areas examined 13 had an achievement percentage of 80 to over 100 percent while the other two areas achieved 76 and 53 percent of target.

A comparison between 2018 and 2018 achievements indicate increased achievements in the following areas: disease control, farmers training, passive disease surveillance visits (poultry, swine, TB abattoir surveillance, ambulatory service, laboratory samples processed and the number of import permit issued. Decreased achievements were noted in the number of vehicle and people undergoing biosecurity measures at the International crossing Lethem, which was attributed to the downturn in the economic fortunes of Brazil, farm visits conducted and Brucellosis and poultry disease testing done.

A weak epidemic-surveillance system and a less than adequate legislative framework continues to impact the work of the unit.

The performance of the regions in terms of achievement of its work programme has been mixed, with some regions surpassing targets while others have done poorly.

QUARANTINE INSPECTION AND CERTIFICATION (ANIMAL IMPORT / EXPORT CERTIFICATION AND CONTROL)

The Quarantine, Inspection and Certification Sub-unit continued the process of improving its capacity to successfully address the countries animal quarantine related issues which is envisaged to result in improved performance, increased work output, improved quarantine control etc. Interventions aimed at strengthening our quarantine systems, import and export control ranged from staff upgrade, public awareness, improved collaboration with Customs and improved vigilance at Ports of Entry. The unit expanded its presence by placing one staff permanently at the International Crossing Lethem, Reg. 9 and in the latter part of 2018 employed new quarantine staff for placement in Regions 1 and 2. Improved

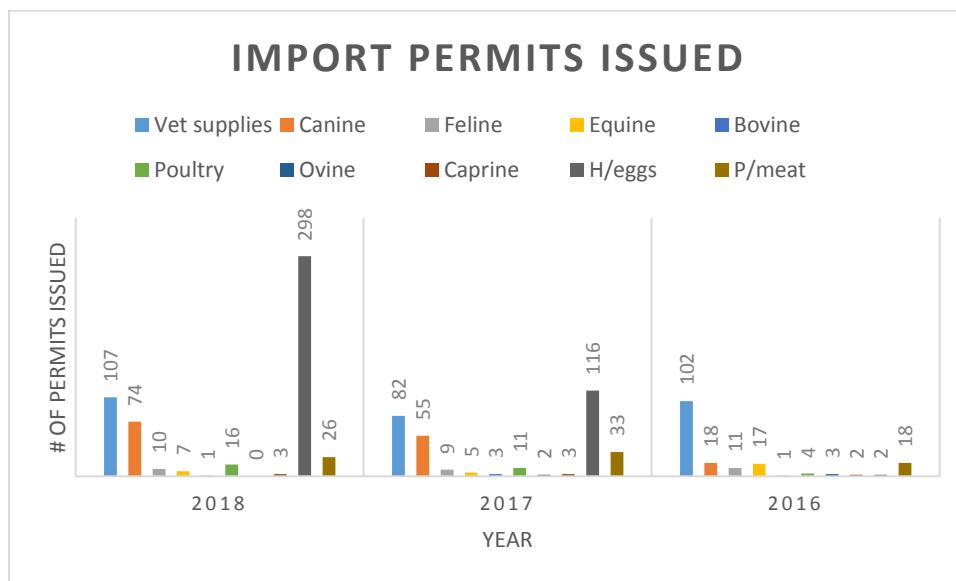
collaboration with customs resulted in stronger control in animal imports and improved compliance by importers of hatching eggs.

Notwithstanding the challenges faced with the Mabura Hill Quarantine Outpost and the loss of staff due to resignation and non-renewal of contract the sub-unit was able to surpass 2018 achievements in majority of areas.

Five hundred and forty-seven import permits were granted in 2018, a 61.8% increase over 2017 figures which is attributed to an increase in the number of permits issued for the import of canines, veterinary supplies and hatching eggs (broiler). There was also a general increase in the number of animals imported and exported during 2018.

For 2018, 752 stop and search activities compared to 2,344 in 2017 were conducted at the Mabura Hill Quarantine Outpost in keeping with efforts at preventing illegal animal movement from Region 9. Activities at the station suffered due to the decision of Demerara Woods to cease the supply of electricity and the need to conduct needed repairs to the building resulting in the prolonged absence of the officer from the location.

Figure 1: COMPARISON OF IMPORT PERMIT ISSUED 2016, 2017, 2018.



The following reflect some successes of the Sub-unit:

- As a result of improved collaboration with Customs and improved vigilance five canine and 12 fighting cocks that did not meet the requirements for imports or were illegally imported were intercepted. The 12 fighting cocks euthanized. The dogs were returned to the place of origin (Suriname and Brazil).
- In addition to the preceding two persons were sanctioned by having to pay a cost for their involvement in a breach of the Animal Health Act 2011.
- During 2018, one canine and 10 horses were accommodated at the Quarantine Station, Timehri for various periods and were subsequently released post certification of their acceptable health status.
- One permit for 600 goat embryos was approved for import from South Africa after a period of verification of the farmer's suitability and preparation to accommodate the import.
- Permits were granted for the importation of fingerlings from the United Kingdom (Fisheries Department, MOA) and aquarium fishes (581) from Trinidad and Tobago (a pet shop.)
- The unit continued to facilitate the export of ice-cream by Sterling Product Limited to Barbados thorough inspection and health certification. There has been an increase in exports of this commodity, 17 export health certificates were granted to the supplier during 2018.

- The unit facilitated the export of poultry feed concentrate from Guyanese suppliers to purchasers in Suriname.
- In an effort to strengthen vigilance in our bordering regions, a staff was placed at International Crossing Lethem, Reg. 9 and in the latter part of 2018, new quarantine staff were employed for placement in Regions 1 and 2.
- In order to better regulate the internal movement of animal and animal products, an Inter-regional permit book was printed and distributed to the regional staff for use. This is envisaged to reduce the likelihood of disease transfer/spread as a result of animal movement within Guyana.
- Positive inroads have been made in the areas of quarantine, inspection and certification; monitoring our borders; internal movement control.
- During the year the unit completed the compilation of a register of veterinary medication sold at veterinary outlets in the country. This register will be used in the determination of future registration and import of veterinary drugs.

EPIDEMIOLOGY/SURVEILLANCE AND MONITORING.

The sub-unit's capacity was boosted by the addition of Dr. Storm to the team, he has commenced the review of the reporting formats and systems; determination of sample population and size using recommended epidemiology methods.

In a quest to attain OIE Brucellosis free certification and in order to maintain Guyana's FMD free status, testing of animals continued: 560 bovines were tested in Regions 2, 3, 4, 6, 7, and 9 with all tested animals being negative, also 922 animals were tested for FMD with negative results in all cases. This data serves to build Guyana's case for eventual certification of being free from Brucellosis.

The Bovine TB surveillance and control programme was enhanced through greater collaboration with the Georgetown Municipal Abattoir and the EHO in the regions. GLDA has enhanced its participation of the Food Safety Committee resulting in better data collection. The success of the Tuberculosis control programme as it relates to trace-back and testing of suspected infected herds continue to be affected because of the location and accessibility of the affected farms, in addition, to poor on-farm infrastructure and temperament of the animals.

Surveillance and slaughter certification visits to abattoir and slaughter poles were 3,093 for 2018 as compared to 2,933 in 2017. For the year 48 positive cases of postmortem Tuberculosis were detected at the Georgetown Municipal Abattoir and the abattoir in Region 7. Trace-back revealed that the animals originated from Region 6. It must be noted that some of the immediate owners of the animals were identified from areas in Region 3, raising the issue of the need for stricter inter-regional movement certification.

Surveillance and monitoring programmes for avian diseases (HPAI, New Castle Disease, Infectious Bursal Disease) continued through 2018. Activities included visits to poultry farms and hatcheries and testing of animals for presence of antibodies to poultry diseases. A total of 429 blood samples were collected from farms across Regions 1, 2, and 7 for laboratory testing, additionally there were 37 hatchery visits conducted. As part of the process of improving our capacity in epidemiology and surveillance, a four-day training exercise in the use of GIS in epidemiology was facilitated by PAHO and PANAFTOZA at which 15 GLDA staff members were trained.

The Guyana Animal Disease Surveillance Plan was successfully finalized through workshops and discussions with other stakeholders. This document will guide the development of the surveillance system and would result in timely interventions geared at protecting the gains in our livestock industry.

The GLDA has commenced discussions with PANAFTOSA, Brazil implement of the Continental Epidemiological Surveillance System (SivCont), an online data management programme managed by PANAFTOSA and used by South American countries which would greatly assist our animal disease surveillance system and disease trend analysis.

DISEASE CONTROL, MONITORING AND ERADICATION

Although there were some challenges, 2018 could be considered a successful year for this sub programme. Out of six targeted areas, five saw an 80 to above 100 percent achievement of set targets with one achieving 53 percent of the target set at the commencement of the year (note, based on population size of the targeted regions the number of blood samples for poultry disease testing was reduced as reflected in the number of samples collected). Tangible outcome in terms of disease control was achieved with the regional staff being able to successfully control outbreaks of Rabies (Region. 3), Equine Encephalitis (Region. 6) with minimal losses to farmers within the affected areas.

As a Rabies disease prevention and control measure 2,653 bovine animals were vaccinated in Regions 1, 2, 3, 7 and 9, a 9.4% increase over 2017 achievement and surpassing the 2018 target by 76.9%. This exercise ensured adequate immunization coverage of at-risk animals in endemic areas resulting in significant reduction in the number of suspected cases of rabies and the prevention in the occurrence of the disease in some areas (Regions. 2 & 9)

In continuation of a programme started in 2016 which was in response to a suspected occurrence of Botulism in Region 9, 4,600 animals were vaccinated in targeted areas, this represents a 18.9% decrease compared to 2017 which is reflective of a normal practice by farmers when there is no occurrence or report of a disease outbreak. This achievement was as a result of collaborative efforts between GLDA and the Regional Administration Region 9 with greater input from the Regional Authority in terms of funding for vaccine purchase and transport to the targeted areas. This intervention resulted in the region not recording any case of botulism for 2018.

Fifteen bat trapping exercises were conducted across affected regions ranging from wound smear to bat trapping, smearing and release. A resulting reduction of number and effects of bat bites was observed.

DISEASE OCCURRENCES

During the period under review a number of disease occurrences were reported and control measures undertaken resulting in the successful control of the disease:

The following disease occurrences were addressed:

- Distemper in unvaccinated dogs was reported in the Golden Fleece- Supenaam Creek Sub-district, Region 2 and in the Perseverance- Anna Regina District. An investigative team dispatched to the area confirmed the disease to be Distemper. Owners of dog were advised to isolate symptomatic dogs and ensure that little to no contact is made with these animals since some aggression is being seen in some animals. Advices were given on the disposal of the carcass once the animals have succumbed. Staff were also instructed to advise owners to ensure that their dogs have been properly dewormed and vaccinated.
- In Region 6 in April one case of EE was recorded in Auchlyne Village and the horse was euthanized. In response public awareness for farmers on the importance of vaccination, and control of mosquitos was done. Survey carried out in the Rosehall to Adventure area to ascertain the vaccination status of horses, as a result of this activity, 54 horses were vaccinated in the focal area. No other case of suspected EE was recorded.
- Bovine Rabies outbreak at Marias Lodge, Region 3. Prevention and control undertaken included the vaccination of 564 animals in the Viva la Force to Catherina Sophia, West Bank Demerara which is above 80% coverage, vampire bat control measures were also instituted. Three outbreaks were recorded in which 68 animals died.

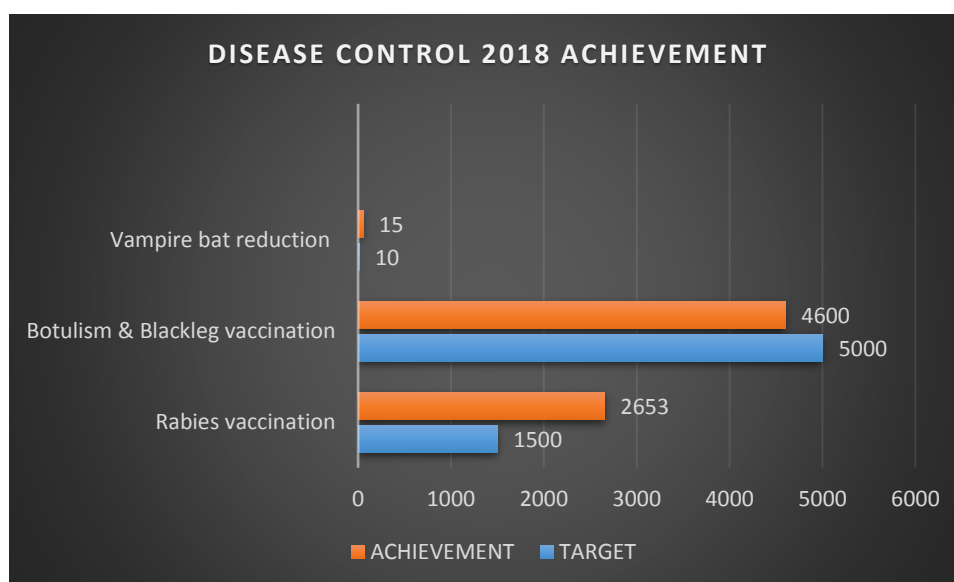
In an effort to improve GLDA's preparedness in case of a disease outbreak response, the unit in partnership with other agencies and with support funding from PAHO – Guyana, conducted a Foot and Mouth Disease simulation field exercise in Mabaruma, Region 1. This activity saw the participation of Staff members from GLDA, Ministry of Public Health, the Guyana Police Force, Guyana Defense Force, Ministry of Finance, Ministry of Communities, Civil Defense Commission, IICA. Evaluators gave positive reviews regarding the quality of the exercise, however there are some aspects of the exercise that needs to be addressed.

In order to improve the country's disease preparedness and response capability a workshop was held in GLDA's boardroom which was attended by persons from agencies to be involved in any disease control and eradication exercise.

The contingency plans for control of occurrences of Bovine Tuberculosis was successfully reviewed and accepted by the Board of Directors of GLDA and the Minister of Agriculture. This document will serve as a guide to the control of Bovine Tuberculosis in Guyana.

As a response to reports of an occurrence of a vesicular disease in Venezuela at an area close to Guyana's border, GLDA mounted a preventative response that included surveillance and monitoring of border crossings in Region 1, public awareness campaigns that included the print and electronic media, printing and distribution of sensitization posters and discussions with local residents, law enforcement, customs and regional management officials. Staff members were dispatched to the areas White Water, Morowana in an exercise of surveillance and monitoring that continued from August through to year end.

Figure 2: DISEASE CONTROL 2018 ACHIEVEMENTS



DISEASE DIAGNOSIS AND LABORATORY SUPPORT SERVICES

The following highlights the achievements of the Veterinary Services Laboratory:

Major activities undertaken / accomplishments

- In 2018 the lab commenced testing services for wildlife export with 681 samples being tested.
- The lab played an important role in the FMD field simulation exercise that took place in Region 1 receiving very good commendations for the execution of their part.
- The lab secured a consultancy to aid with the establishment of a quality management system towards local certification and eventually accreditation. This process is ongoing.
- For the first time we took part in a rabies inter-laboratory proficiency testing at the laboratory using the DFA technique with samples sent from Mexico. We were able to correctly determine 9 out of 10 samples. (we called a negative and weak positive)
- Servicing of all critical equipment including biosafety cabinets was accomplished in November of this year.

- The laboratory has benefited from quality management capacity building through trainings and consultations from GNBS in the ISO 17025 standard as part of the National Quality Infrastructure project.
- Continued collaboration with pathologist Dr. Herman Reid has allowed us to continue collecting, processing and evaluating samples of interest from slaughter facilities and farms.
- Tick samples shipped to Trinidad and Tobago for DNA extraction and analysis in Guadeloupe
- Presentations were made to
 - Food & Drug Dept. - zoonosis and food
 - Wildlife division – laboratory services for export

Table 4: DEPARTMENT ACHIEVMENT (INFECTIOUS LAB) RABIES

Samples collected	Samples processed	Discarded	Results
22	22	0	2 positives 18 negatives 2 inconclusive

Table 5: DEPARTMENT ACHIEVMENT- PATHOLOGY

Samples collected	Samples processed	Discarded	Remarks
188	188	none	

Table 6: DEPARTMENT ACHIEVEMENT: PARASITOLOGY

Samples collected	Samples processed	Discarded	Remarks
1289	1152	137	

Table 7: DEPARTMENT ACHIEVEMENT: SEROLOGY

Samples collected	Samples processed	Tests conducted	Discarded	Remarks
2285	2273	3200	7	681 wildlife tested

Table 8: SUMMARY OF DEPARTMENT ACHIEVMENTS (PROJECTED VS ACTUAL SAMPLES COLLECTED)

Department	Annual Target	Actual	% Accomplished	Remarks
Infectious lab	50	22	22	
Pathology	120	188	63	Samples collected for histopathology evaluation
Parasitology	2000	1152	57	
Serology	4296	2273	53	Samples in storage awaiting test kits

Main reasons for not achieving targets were:

- The establishment of the department to handle PCR works did not develop at the rate to allow for testing to be done
- Services such as haematology analysis are not being requested

Major disruptions / constraints during the year (2018)

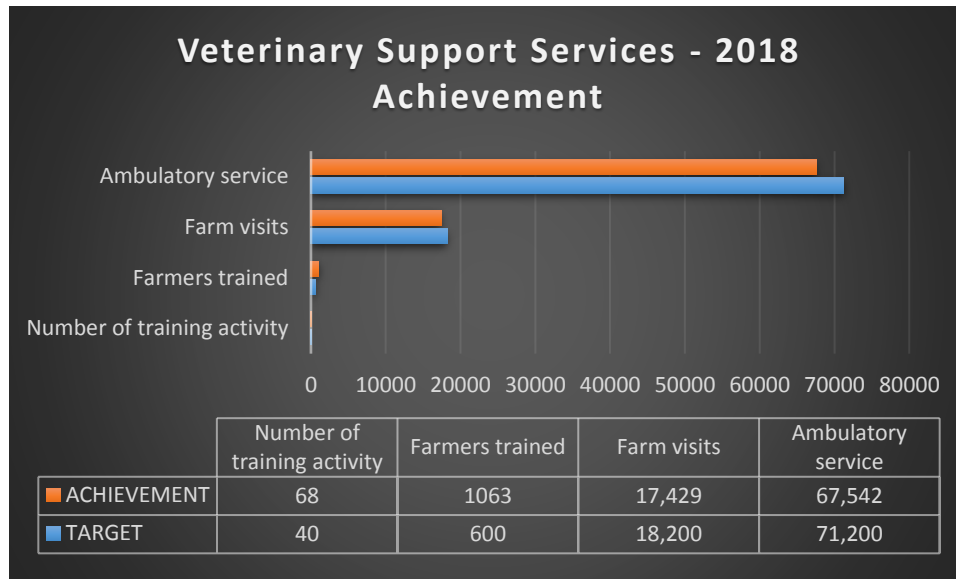
- Unstable electrical power supply played a major part in the disruptions we experienced.
- Inability to have equipment fixed in a timely manner just as air conditioning units.
- Slow response from maintenance department contributed to delays in remedying situations.
- Extended delays in receiving materials ordered.

SPECIES SPECIFIC ANIMAL HEALTH PLANNING AND SUSTAINABLE LIVESTOCK PRODUCTIVITY (VETERINARY SUPPORT SERVICES)

Activities undertaken during 2018 encompassed farm visits, provision of ambulatory services and training of farmers. These activities catered to the needs of farmers and staff members and focused on improving their knowledge and ability to respond to animal health care, disease identification, the prevention and control of diseases and also maintaining the productivity of animals at an acceptable level. Achievement in this area of the animal health work plan ranged from 95 to 177% of set targets.

- In order to provide farmers with the necessary skills in the support of good on-farm animal health practices, 68 farmers training sessions were conducted as a result of which 1063 persons from across all administrative regions benefitted. This amounts to 170 and 177.2% respectively of the target set for 2018 and an approximate 26% increase over 2017 achievement.
- Through the provision of ambulatory service across the 10 administrative regions, 67,542 animals of different species were treated for various ailments and disease. This activity served to minimize the potential economic losses to farmers as a result of loss of productivity and death of animals. This figure reflects an 18.1% increase over the number of animals treated in 2017.
- In 2018 a targeted figure of 18,200 extension visits to farms were planned of which 17,429 were realized reflecting 95.8 % of target. Compared to 2017 this is a 4% decrease in the number of farm visits made. This activity however was complemented by an additional 2,258 visits to selected core farmers in which technical advice on how to correct identified shortcomings in the areas of animal health and general management was given. These interventions impacted in the production and productivity of the selected farms in a positive way and also ensured that these farms are closer to attaining certification.
- Staff members of the Unit participated in a number of training activities ranging from basic epidemiology, applied epidemiology and GIS, Veterinary parasitology.
- During 2018 the regional offices of GLDA commenced a programme of result driven treatment with special focus on internal parasites control. A total of 1,293 samples, the majority being fecal samples, were submitted to the Veterinary Services Laboratory for internal parasite diagnosis. This activity was a timely positive demonstration to farmers, targeted treatment resulting in better growth, reduced drug usage and reduced cost.
- On 25th July 2018 a Tuberculosis Workshop in collaboration with Environmental Health Department (EHD) and Ministry of Public Health (MOPH) was held at Sensational banquet hall Springlands, Region 6, a total of 60 participants attended. Presentations were made by MOPH and EHD of the region.
- During agriculture month 2018 animal clinics were held in Regions 2, 3 and 6 as part of the agriculture month programme. For the month three exercises were held in which 112 farmers benefitted and 3036 animals treated.

Figure 3: VETERINARY SUPPORT SERVICES 2018 ACHIEVEMENTS



INTER AGENCY COLLABORATION

The GLDA during 2018 expanded its relationships with several local and international organizations including PAHO/WHO, IICA, FAO, Partners for the Americas, UWI, (One Health, One Caribbean, One Love project), REDIPRA, CaribVet, PANAFTOSA, Purdue University College of Veterinary Medicine, USDA APHIS, Guyana Poultry Producers Association, Guyana Swine Association, Guyana School of Agriculture, University of Guyana, Ministry of Public Health (Veterinary Public Health Unit, Customs, GNBS, Guyana Police Force, Regional Democratic Councils, Ministry of Business, ASDU, Min. of Agriculture .

Below are highlights of several activities supported by these organizations and agencies:

- Provision of financial and technical support for the successful execution of the FMD Simulation Exercise in May, 2018. (PAHO/WHO, PANAFTOSA)
- Training in parasitology (UWI).
- Funding of Visit by consultant (rabies specialist) for PANAFTOSA (October 2018) to assist in the development of a Guyana national programme for rabies control (PAHO)
- Facilitating online training in epidemiology in which three persons from GLDA successfully participated and completed (PAHO).
- Facilitating of anti-microbial resistance and anti-microbial stewardship training. (PAHO)
- Facilitation of local training attachments for GLDA's staff members (Georgetown Public Hospital Cooperation).
- Assist in the Interception of illegally imported animals. (Guyana Police Force, Customs)
- Funding the purchase of much needed materials for the Veterinary Services Laboratory.
- Fostering greater collaborations between all agencies involved in Public Health and Food-safety e.g. Improving of our disease surveillance network for TB and other diseases (PAHO, Mayor and Councilors of Georgetown, Food Safety Committee – Min. of Public Health).
- Organising and funding of applied epidemiology and GIS training workshop in Guyana (PANAFTOSA, PAHO/WHO)
- Quality management capacity building and system upgrade at the Veterinary Services Laboratory through trainings and advice from GNBS.
- GLDA through its bi-lateral relationship with Purdue University College of Veterinary Medicine, USA facilitated a successful three weeks attachment of one of its veterinary medicine students.

- Food safety and Ante-mortem capacity building visit to Suriname (visit to abattoir and examining food safety system of the country) in which one staff member from GLDA participated (PAHO)
- International Air Transport Association (IATA) on-line training sponsored by CaribVET.
- Participation in Wildlife Conservation and Management Commission (WCMC) training titled “Human-Wild Cat Interactions: Developing Sustainable Solutions for Co-Existence”.

VISITS TO RIVERS AND CREEKS USING GLDA’S BOATS:

During 2018 GLDA continued to provide a cost free veterinary and livestock extension services to Riverine communities through the use of its boat. Service was provided to livestock farmers with a view of reducing the effect of diseases and at the same time equip them with the necessary technical advice to ensure that they adequately manage their livestock operations enabling income generation and nutritional security. Visits by the GLDA team over the years resulted in an increase in the number of livestock farmers and animal numbers in the targeted areas. An Improvement in on-farm management practices were also observed.

Riverine Areas Visited:

- Essequibo River
- Bonasika Main and Creek
- Mazaruni /Cuyuni River
- Berbice River
- Demerara River
- Mahaicony creek
- Canje river
- Orealla, Siparuta
- Region 7 riverine communities

TABLE 9: CATEGORY OF ANIMALS TREATED

Category		Sheep	Pigs	Horses	Goats	Poultry	Donkey	Cattle	Dog	Cats	Rabbits
# of Animals treated	2012	986	175	1	365	15,056	0	1,549	7	0	0
	2013	2,885	491	6	731	46,087	2	1,764	96	0	0
	2014	2,883	496	32	460	35,396	1	1,734	200	2	2
	2015	2,758	352	42	262	41,366	2	1,022	288	1	3
	2016	699	311	0	227	11,122	0	604	12	0	0
	2017	755	369	36	492	4,807	0	1128	0	0	0
	2018	1,125	86	24	233	4,929	0	560	73	1	0

The following are achievement emanated out of this necessary intervention:

- 1) During the year in review a total of 35 riverine extension visits were made and 350 farm visits were completed in the Demerara, Essequibo and Berbice rivers and creeks. A total of 7,032 animals (1,125 sheep; 86 pigs; 233 goats; 560 cattle, 4,929 poultry, 24 horses, 73 dogs and one cat) were treated. These figures reflect an increase in visits (20 trips and 218 farms visited compared to 2017 however, the number of animals treated reduced by 9.7%.
- 2) The riverine visits highlighted the inter-agency collaboration between GLDA- NAREI in extension service delivery. Farmers benefitted from advice on good livestock and crop management practices, disease prevention and control measures.

- 3) During these visits the team continue to give free Rabies vaccination and animal treatment. Bat reduction exercise, collection of fecal samples from cattle, sheep, swine and goats, animal disease surveillance also formed part of the exercise.
- 4) Service was provided to riverine communities in Region 7 area where advice focused primarily on livestock management issues.
- 5) Staff from the Apiculture unit formed part of the visiting team and was able to provide training on bee keeping at Alikí Essequibo River and at Mazaruni Prison.

ANIMAL PRODUCTION UNIT

The Animal Production Unit (GLDA) during 2018 was involved in a number of activities aimed at supporting livestock farmers across the ten regions in the improvement of their management practices which will ultimately result in increased production and productivity due to the efficiency with which they carry out their farm operations. The unit also collaborated with the Ministry of Indigenous Peoples Affairs, Ministry of Communities and FAO in providing technical support in terms of training for the guidance, implementation and monitoring of Community Development Plans (CDPs) under the Amerindian Development Fund (ADF) Project. The Black Giant Project which is part of GLDA's Hinterland Development Programme continues to supply chickens to hinterland and riverine communities in Regions 1, 2, 5, 6, 7, 8, and 9 to boost their nutritional base with the provision of eggs and to a lesser extent meat.

Table 10. FARM VISITS ACHIEVED 2018

Particulars	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Regular Farm Visits	1,899	2,210	2,511	2,480	2,265	2,557	2,031	2,054	2,032	2,559	2,340	2,074	27,012
Pilot Farmer Visits	159	186	193	207	244	123	206	230	133	191	230	205	2,307
Total Visits	2,058	2,396	2,704	2,687	2,509	2,680	2,237	2,284	2,165	2,727	2,474	2,279	29,319

Improvement in livestock production parameters were seen in almost all of the livestock production commodities as observed on Table 11. 2018 saw overall increases in production of livestock commodities. In his budget speech, the Minister stated *“the livestock sector has rebounded this year, with production as at the end of June, 2018 growing by 29.1 percent, when compared with the same period, in 2018. The absence of chicken shortages, thereby negating the need to issue import licenses thus far, in 2018, testifies to Guyana being on the right path to self-sufficiency in chicken production. Higher beef, pork and mutton production, as a result of better breeds and enhanced practices, also contributed to growth in this sector at mid-year and are likely to lead to similar gains in the second half of the year. As such, the livestock sector is forecasted to grow by 21.1 percent this year.”*

Growth in the livestock sector of Guyana can positively impact the livelihood of the livestock farming community, it has the potential to increase employment, generate income and aid in development.

TABLE 11: LIVESTOCK PRODUCTION DATA 2018

Month	Poultry Meat Local (2018)	Table Eggs Local (Each-2018)	Beef (kg) 2018	Pork (kg) 2018	Mutton (kg) 2018	Chevron (kg) 2018	Milk (Litres)2018
January	2,813,499	2,051,980	129,852.23	55,419	8,163	3,982	3,339,475
February	2,746,343	2,159,064	145,988.35	83,427	5,979	3,205	3,029,740
March	4,665,600	2,174,068	162,050.56	35,247	5,117	2,130	3,213,150
Q1- Total	10,225,442	6,385,112	437,891.14	174,093	19,259	9,317	9,582,365
April	3,949,855	2,060,204	96,834.18	43,068	4,518	2,013	3,134,025
May	3,390,512	2,208,416	153,805.23	43,684	5,002	2,255	354,700
June	3,652,948	2,369,590	161,691.62	44,777	5,063	2,550	3,447,075
Q2- Total	10,993,315	6,638,210	412,331.03	131,529	14,583	6,818	6,935,800
H1 Total	21,218,757	13,023,322	850,222	305,622	33,842	16,135	16,518,165
July	3,458,376	2,239,520	164,846.81	35,077	4,360	2,148	3,494,940
August	3,088,309	2,617,096	301,703.94	30,001	5,630	2,430	3,461,460
September	3,393,163	3,123,640	132,666.54	50,537	3,098	1,807	3,465,600
Q 3- Total	9,939,848	7,980,256	599,217.29	115,615	13,088	6,385	10,422,000
October	4,094,595	2,990,632	204,604.48	54,633	4,345	2,335	3,345,210
November	3,225,625	3,536,638	188,462.52	54,287	4,856	2,565	3,480,525
December	3,543,376	4,545,779	285,426.26	40,741	4,502	2,816	3,525,165
Q 4- Total	10,863,596	11,073,049	678,493.26	149,661	13,703	7,716	10,350,900
H2 Total	20,803,444	19,053,305	1,277,711	265,276	26,791	14,101	20,772,900
TOTAL	42,022,201	32,076,627	2,127,933	570,898	60,633	30,236	37,291,065

*Note: Qurbani was celebrated in August which saw the slaughtering of 500 bulls at an average weight of 220kg

*Beef data for last quarter are estimated figures

POULTRY SUB SECTOR

The performance of this sub-sector continued to be strong, with the industry recording an increase in broiler meat production by **37%** when compared to 2017 production and table eggs increased by **11%** when compared to 2017.

Noteworthy also was the 53 % in increased in broiler meat production experienced in the 2nd quarter of 2018 when compared to the same period of 2017. Further, in the third quarter for table eggs was a **11%** increase in production, when compared to a similar period the previous year. Overall the prices for these commodities remained relatively stable during 2018, at \$33/egg, except when it spiked to \$50/egg in December for the Christmas season.

In this regard, broiler meat importation was negligible. For the reporting period there was an importation of 301 kg of processed chicken, valued at GY\$340,080.

BEEF SUB SECTOR

The annual beef production for 2018 was estimated at 2,127,933 kg, a 1% increase when compared to 2018's output levels. In regards to imports, a total of 42,860 kg of beef was imported, valued at GY\$ 30,533,734. This give a total market size of 2,035,560 kg. This provides unique opportunities for local producers, with the relevant capacities, to exploit.

PORK SUB SECTOR

The total pork production in 2018 was recorded at 570,898 kg (Table 11). This represented an increase of 88 % over the 2018 output level. However, it should also be noted that Regions 3 and 4 outperformed the other Regions. Overall the first quarter in 2018 saw the highest levels of production for the year and there was a steady decline. Despite this quarterly decline 2018 saw an increase of 21% when compared to 2017's production. This significant increase in pork production can be attributed to improved husbandry practices, imported improved breed, GLDA's genetic improvement programme as well as improved monitoring of production data.

Pork imports on the other hand amounted to 32,665 kg, valued at GY\$ 25,110,500 this gives a total market size of 603,563 kg. Here again, this presented an opportunity for local producers to tap into this market.

MUTTON & CHEVRON SUB SECTOR

Mutton and chevon production for 2018 were recorded at 60,633 kg and 30,236 kg respectively. When combined, this represented a decrease of 9% when compared to the 2017 output level. However, when analysed independently there was a 6% increase in chevon production, while there was a 15% decline in mutton production.

A total of 16,716 kg of mutton valued \$ 12,533,043 was imported in 2018. This represented a total market size of 77,349 kg or 107,585 kg if local chevon production included. This shows potential market opportunity for local producers to tap into. However, the quality of the local mutton will have to be significantly improved in order to capture this market.

MILK PRODUCTION

Data collection from this sector, like the other sectors, continued to be challenging. Despite this situation, the industry produced 37.3 million liters (37.3 million kg) of milk, which was a decline by 3.42 %. Moreover, it should be noted that milk production has been continuously declining with a 5.73% decrease from 2016-2018, a 3.42% decrease from 2017-2018 and a total of 8.95% decline from 2016-2018. Several reasons were advanced for this decline, namely lack of markets and processing facilities, reduction in number of dairy animals, cattle rustling, lack of sufficient pasture to encourage dairy farmers and extreme weather conditions at varying time of the year. Further, it is important to state that milk import for 2018 was 7,904,177 kg carrying a value of \$4.9 billion Guyana dollars, while milk exported was 498 kg with a value of GY\$314,400. This gave a total domestic market size of 48,641,065 kg and which represented some substantial marketing opportunities for product diversification.

HONEY

A total of 25,356 kg of honey was imported, valued at GY\$11,207,994, while Guyana exported 14,104 kg valued at GY\$ 1,737,990

RESEARCH

The GLDA staff presented two research papers at the National Agricultural Research and Extension Conference held in October, the principal authors were Dr Turney and Mr Cameron. The abstracts of the papers are herein presented.

The Topigs 40: A recent introduction to Guyana, its performance and potential

Rondel Ray Cameron¹, Fenton Nickram, Doshanie Kishun, Colleen Bascom

Abstract

The Guyana Cooperative Swine Producers Association in 2016 imported 101 Topigs 40 animals inclusive of 93 gilts and eight boars from the Suriname Pig Farm. The Topigs 40 pig was bred to satisfy three objectives, these include the highest total feed efficiency, high producing and easily bred sows and high meat yields and faster growth rates. The Topigs 40 is a product of crossbreeding two synthetic lines; the sow A-line and the boar B-line. The A-line sow is the Large White type, with characteristics as a short build, good fertility, high feed intake and outstanding fattening quality for the piglets. The B-line boar is based on the Piétrain and the Large White breed with characteristics as strong legs, good fertility and high feed intake. The Guyana Livestock Development Authority monitored the performance of these animals, which were located in five administrative regions, and distributed to 31 farmers of whom 10 were women. The average litter size was 14.26, with 12.25 piglets born alive and the still birth percentage being 12.50, the pre-weaned mortality percentage was 21.72, the average weaned piglets were 9.55, with an average birth weight was 1.47 kg. In Brazil, the Topigs sows achieved an average production of 28.6 weaned piglets per mated sow per year in 2008. These results were obtained from 25 farms with a total of over 38,600 Topigs 40 sows. The top farms achieved 30.67 weaned piglets per mated sow. Additionally, the average litter size was 12.4 live-born piglets. The farrowing rate was 92.9%, the mortality rate of the piglets until weaning was 7.1%.

Key words: Topigs 40, average litter size, piglets born alive

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Efficiency of four anthelmintic drugs on GIN in small ruminants at the Guyana Livestock Development Authority Farm, Mon Repos

Author: Ren e Turney, David Pusselwhyte, Kellisha Edwards and Dane Hartley,
Guyana Livestock Development Authority, Agriculture Road Mon Repos, East Coast Demerara, Guyana,
South America.

Abstract

Gastrointestinal nematode (GIN) infections are considered among the toughest challenges small ruminant farmers face not only in Guyana, but globally. Losses as a result of mortality and cost of treatment to reduce these losses are some of the challenges small ruminant farmers face as they seek to combat this problem. Traditionally, the control of GIN infection has been largely based on the use of anthelmintic drugs, however, throughout the years the efficacy of these drugs has decreased due to overuse and consequently GIN developing resistance to the drugs. A study was carried out to determine the effectiveness of four anthelmintic drugs Ivermectin, Levamisole, Fenbendazole and Albendazole on GIN on the Guyana Livestock Development Authority (GLDA) Livestock Farm, Mon Repos, East Coast Demerara. Faecal Egg Count data was analysed from 45 animals (sheep and goat) using the Modified McMaster technique. Anthelmintic efficacy was determined using the faecal egg count reduction test (FECRT). Albendazole, Ivermectin, Fenbendazole and Levamisole demonstrated efficacies of 4.7% (1/21), 10% (1/10), 12.5% (1/8) and 37.5% (3/8) respectively. The use of Levamisole had proved to be the most effective drug tested. The study suggests that there is need for the implementation of other control strategies against GIN.

Key words: Anthelmintic efficacy, faecal egg count, gastrointestinal nematodes

APICULTURE

9th Caribbean Beekeeping Congress

The Caribbean Beekeeping Congress was held during the period between 19th -23rd November, 2018. The congress activities were carried out at the Guyana School of Agriculture's Auditorium. GLDA was represented by Dr. Dexter Lyken, Mr. Timothy Mentus, Ms. Doshanie Kishun, Ms. Trishanna Alleyne, Mr. Melryc Walters and Ms. Anastasia Mendonca.

Wax Foundation Press

A Wax Foundation Press was donated by Ms. Amy Weekes, a beekeeper and friend of the beekeepers of Guyana, and a US volunteer of the Partners of the Americas program. Funding for the purchase of the Wax Foundation press was acquired through donations raised by the launch of a GO Fund Me page, and the cost of postage and all related taxes was borne by the GLDA. The intended beneficiaries of this venture are all of beekeepers of Guyana, and it will enable the beekeepers to be supplied with and also make their own wax foundation, which is important when setting up of a new hive.

BEEF UNIT

Prices for Beef:

Over the year 2018 retail, prices of beef remain stable at both the Stabroek and Bourda Markets (Locally). While on the world market beef prices fluctuated during this reporting period. The bar graph below indicates the average Price per Kilogram of Beef. This trend clearly indicates that local beef prices are much lower. It must be noted that at these prices local sales did not focus on choice cuts and packaging of processed meat. Locally, wholesale price for beef carcass was sold at \$772 per Kg.

At the Georgetown Abattoir for 2018, there were some 4,155 animals slaughtered and at the Rising sun Abattoir, some 2,031 animals registered as slaughtered via the Drop box.

The total carcass weight produced from the Georgetown Abattoir was 779,983.57 Kg, while Rising Sun Abattoir data recorded via drop box revealed some 322,310.04 Kg of beef was produced.

At the Georgetown Abattoir, the average age of the bulls slaughtered were approximately 4.36 years and the average slaughter weight was 187.93 Kg.

TABLE 12: BREAKDOWN OF SLAUGHTER AT GEORGETOWN ABATTOIR, 2018

Category	# Slaughtered	Slaughter age (years)	Average Slaughter Weight (Kgs)
Bulls	2053	4.36	187.93
Cows	1917	8.68	189.46
Heifer	94	3.61	128.84
Steers	91	4.55	206.71

TABLE 13: BREAKDOWN OF SLAUGHTER AT RISING SUN ABATTOIR, 2018

At the Rising Sun Abattoir, Bulls were much younger at 3.76 years.

Category	# Slaughtered	Slaughter age (Years)	Slaughter Weight (Kgs)
Bulls	1639	3.76	156.21
Cows	214	6.05	181.37
Heifer	11	3.73	174.27
Steers	167	4.02	151.91

Over the last twelve months, females slaughtered were heavier with the greatest difference observed in December 2018. The mean amongst females were 173.34 kg. This trend varied over the previous months. One of the main reasons for this observed pattern was the varied age and weight of the animals at slaughter based on their system of management which were mainly extensive in nature,

Carcass by Mass across Regions

During 2018, seven regions were monitored actively via GLDA's Drop Box. Region 4 accounted for approximately 34.34 % (4,072 animals with total slaughter weight of 760,857.57 Kg) of all animals slaughtered at the Georgetown Abattoir alone. Region 5 accounted for 30.24 % (3,585 animals with total slaughter weights of 552,444.32Kg). These two regions accounted (Region 4 and) for some 64.58 % of total animal slaughtered.

In 2018 it has been estimated that the total carcass weights of beef slaughtered in Guyana was 2,017,931.94 kgs, at an average of 165.53 Kg.

SHEEP PRODUCTION

The section currently comprises of two farms located at Mon Repos and Ebini in Region Ten. Operations in the Ebini Sub-unit are under the management of Mrs. Roxanne Langevine. The Mon Repos farm currently have ninety-four (94) breeding Ewes and six (6) breeding rams inclusive of four Barbados Blackbelly and two Katahdin which directly aids the Artificial Insemination (AI) programme. The Goat Herd has three (3) Breeding Bucks, two of which are directly involved in the AI programme. The Barbados Blackbelly is the dominant breed with small reserves of females of the Corentyne White and Virgin Island White animals. The AI programme benefitted from the two Katahdin Rams, One Boer Buck and an Anglo-Nubian Buck. Farmers have started receiving semen from proven sires to boost their herds. In excess of 100 farmers benefitted from training in various aspects of Small Ruminant husbandry through field trip visits to the livestock station. Over 100 students from the University of Guyana and the Guyana School of Agriculture were trained in basic Small Ruminant husbandry and associated practices. Farmers took advantage of quality Breeding Rams made available for sale.

Although 80 breeding animals were made available only 39 have been sold thus far; all of the farmers on the Breeding Animal Request list were contacted and given an opportunity to view and purchase the animals made available that were mainly of the Barbados Blackbelly breed

Five farmers were selected in each region and work done to improve their key performance indicators; thus far data is not available to show the impact of this intervention.

With the introduction of the Kathadin cross lambs from Artificial insemination a weight gain and average daily gain trial were recorded. All lambs were confined and fed creep feed as supplement and weight gains were taken.

TABLE 14: AVERAGE WEIGHT GAINS OF 3 BREED OF SHEEP AT GLDA FARM

Lamb age Days	Average daily gain (G)	Average daily gain (G)	Average daily gain (G)
	Barbados Blackbelly	Kathadin	Virgin Island White
30	151	166	151
60	136	136	113
90	111	141	106
120	102	117	98
150	90	112	93
180	88	106	90

TABLE 15: FLOCK MOVEMENT (OVINE)

Month	Opening Stock	Births	Deaths	Sales	Transfer In	Transfer Out	Donation	Stolen	Closing Stock
January	132	1	3	12	45	45	0	0	118
February	118	2	0	5	39	39	0	0	115
March	115	38	10	2	0	0	0	0	141
April	141	7	7	1	0	0	0	0	140
May	140	7	0	1	0	0	0	0	146
June	146	4	1	4	0	0	0	0	145
July	145	0	4	7	51	51	0	0	134
August	134	11	2	3	0	0	0	0	140
September	140	1	4	0	0	0	0	0	137
October	137	2	3	0	0	0	0	0	136
November	136	0	2	0	18	0	0	0	147
December	147	0	3	1	0	0	0	0	143

BLACK GIANT

Introduction

The Black Giant Project is one of the most successful programmes of the GLLDA and forms part of our Hinterland Development Programme. This bird was chosen to produce a cheaper source of meat and eggs for those communities mainly because of its ability to survive by adapting to harsh conditions and to convert grass and other household foods to meat and eggs.

The project started in April 2016 with locally acquired birds but due to the importance being placed on this venture management imported eggs from Brazil from which a pure-bred flock was hatched in November, 2016.

Those chickens from the imported eggs began producing in April, 2018 and hatchlings became available from June 2018.

Collaboration

The GLDA is also collaborating with the hinterland development programmes of the Ministry of Indigenous Peoples Affairs, the Ministry of Social Protection and FAO. The role of the GLDA is to provide the chickens and train the farmers and residents in the proper techniques required for the successful rearing.

TABLE 16: BLACK GIANT PRODUCTION 2018

Month	Eggs Transferred	Chickens Hatched
January	2,390	1,711
February	2,332	1,793
March	2,637	2,090
April	1,475	1,386
May	2,049	1,412
June	2,036	907
July	2,386	1,500
August	2,724	1,890
September	1,839	1,421
October	1,986	1,167
November	4,686	2,390
December	4,059	3,020
Total	30,599	20,687
Hatchability		67.6%

Distribution

A total of 4,076 chickens were distributed to hinterland communities in Regions 1, 5, 6, 7, 8 and 9, while 200 chickens were distributed to two schools (Wauna Secondary and St. Cuthbert's Mission Secondary). The remainder comprising of 16,411 were sold to farmers on the coastal regions.

SWINE

The following *activities* were conducted in the year 2018.

1. Capacity building workshops for both the staff of GLDA and swine producers about innovative and upgraded technologies
2. Fifty (50) copies of the Pig Farmers Manuals were distributed to various regions to help boost the swine production.
3. Monitor the implementation of the breeding programme designed by the Genetics Improvement Specialist at the Breeding and Research Stations and farming community
 - a. Piglets ID and registered
 - b. Birth weights recorded
 - c. Weaning weights recorded
 - d. Litter size recorded

EBINI LIVESTOCK RESEARCH STATION

TABLE 17: RAINFALL & SUNSHINE AT EBINI

Months	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall (mm)2016	5.5	105.3	24.7	329.5	358.1	325	252.7	173.6	204.1	41.4	84.2	304.2
2017												
2018	119.5	95.9	34.8	277.3	316.7	370.3						

After the rains in January there was period of dry that lasted for approximately 75 days, during which time our pastures became depleted and animals were grazed out. (George et al. 2001 a) expressed that on annual rangeland grazing forage quality is poor during dry season. Hence during this time MUB were made for ruminants and mineral salts were fed when materials were available.

In April there were intermittent rains and this allowed for the recuperation of pastures and some land preparation. 370.3 mm of rainfall has been recorded for June, which is 54 mm more than the previous month. When 2016 is compared with 2018 it is observed that there is a lot more precipitation in 2018.

Large Ruminants

In 2018 the Large Ruminant Section the herd grew Figure 4, by a total of 142 animals, which was tabulated to be 1.89 % growth from the calves born during the breeding season. Additionally, there were transfers of some breeding bulls and dairy animals.

Figure 5: shows the births in large ruminants for the periods in review. In 2017 it can be observed that there was a 20 % increment in births from 2016 with a number of 150 calves. An increase is also seen in October, this is in sync with the calving season. Births that were out of the calving season was due to weak fence lines that had been breached causing bulls to be mixed with herds out of breeding season. In 2018 there has been 136 births. Figure 5, demonstrates that May-June and Dec –January is when the mortality rate elevated for 2016, 2017 and 2018. Having the breeding season in January has proven to be good but June-July breeding for February- March calving in the dry can also be explored.

FIGURE 4: HERD GROWTH FROM 2017-2018 CATTLE- EBINI

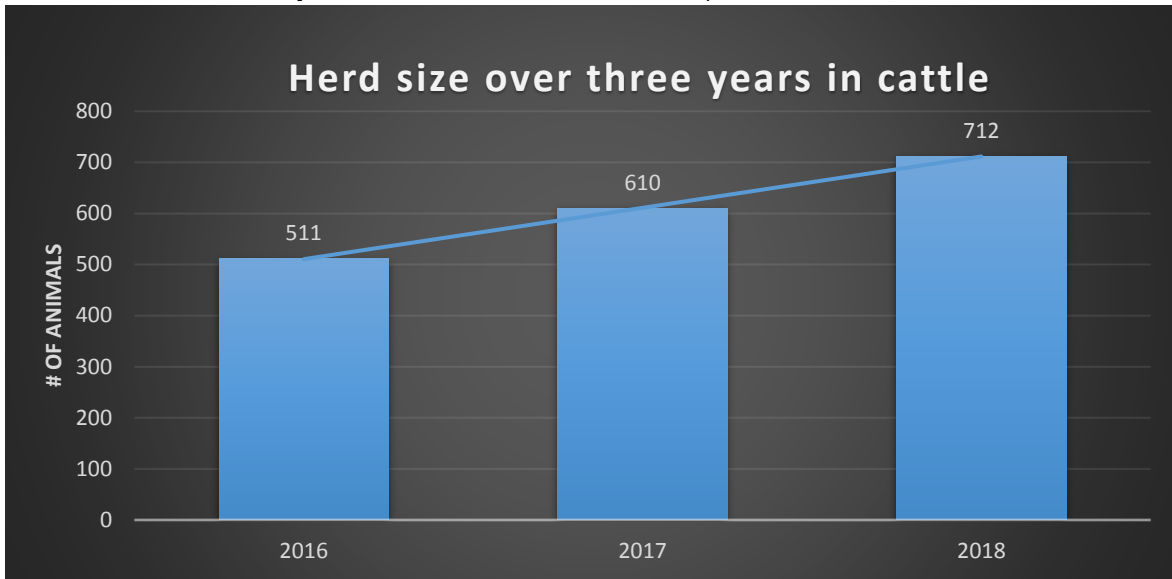
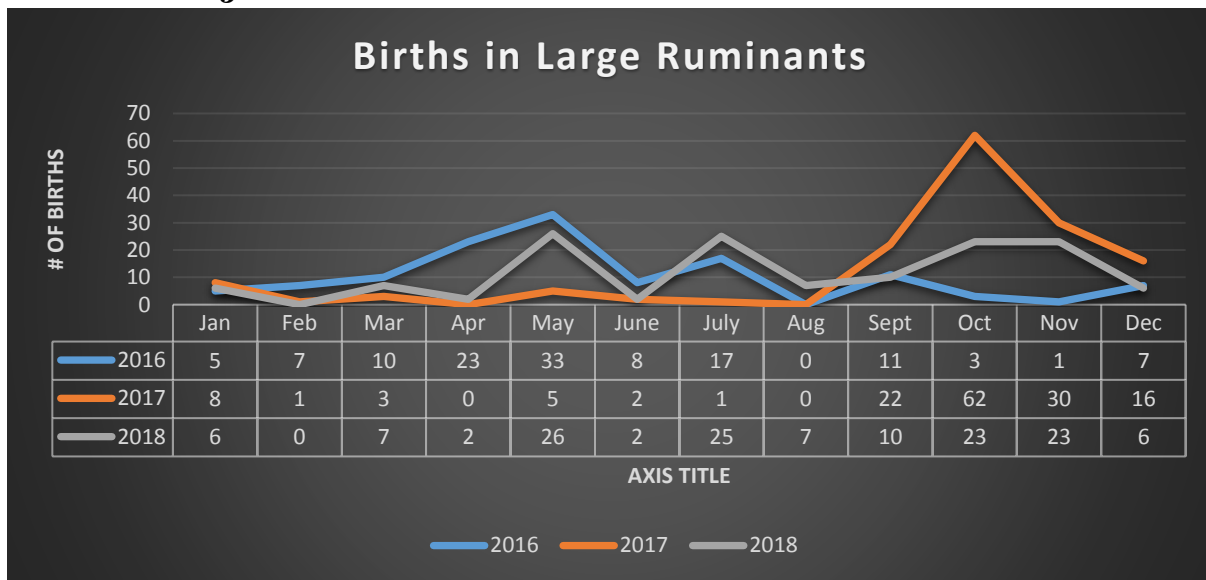


FIGURE 5: ILLUSTRATES THE BIRTHS IN LARGE RUMINANTS FOR 2018



There has been an increase in the average weaning weight of cattle from 2017. The average weaning weight of the beef herd in 2017 was 167kg, animal gaining 0.92 kg per day and in 2018 it was 206.4 kg with average daily gain of 1.14 kg per day.

In 2017 the highest birthweight was recorded in large ruminants at 29.7 kg. The Brahman herd produced the calves with an average birthweight weight of 34.01 kg. It is observed that for 2018 the Ebini Station recorded births in Beefmaster flock at 37.5 kg. An increase in birth weight of calves can be justified by the careful selection of breeding bulls placed onto the cows during breeding season. (H. Thomas, 1998) expressed that calf size at birth is mainly determined by genetics. If a heifer was large at birth, her calves will probably be large also; if cow is bred with sire of similar traits a reasonable size calf is expected.

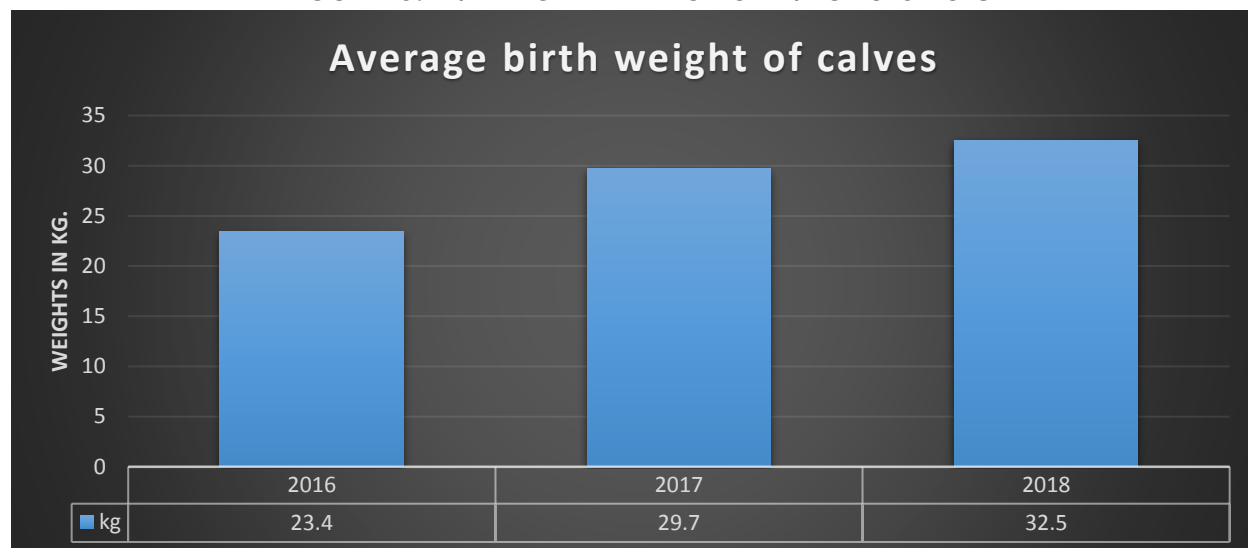
The breeding season usually begins on December 15th. The 2017-2018 breeding season has been postponed to a later date, due to a few constraints which are presently being dealt with.

The mortality rate was 2.30% for 2018 which is still lower than projected 10% than the previous years, the highest mortality over the years have been in the year 2016 where it was at 15%, which was 5% over the estimated measure for the year. A 9% decrease in mortality was recorded in 2017 from 2016, most deaths coincide somewhat with calving period. In September and October of 2017, a total of 2 heifers died due to

difficult birth. (H. Thomas, 1998) emphasized that older cows and heifers may need special care at calving to not lose cow or calf. Management practices have been improving over the years as it relates to care of calf at birth and after.

There has been 9 sales and 39 transfers off station. Of the animals sold, the station was able to earn \$3,673,285.00. The animals slaughtered and sold on the station, totalled to \$256,000.00. This figure expresses the sum for the monthly slaughtering of bulls on the station.

FIGURE 6: AVERAGE BIRTH OF CALVES 2016-2018



Constraints

Poor fence material- This prevented the separation of animals by category and also caused poor pasture utilization.

Corral- The material used to build corral is not of good quality and many times it would break as animals would be loading in.

Poor servicing of machinery and equipment- this caused a lot of down time for the tractors which put a halt to operation in many instances.

In the following tables the growth rate along with other parameters measured for the year would be demonstrated.

TABLE 18: STOCK COUNT FOR CATTLE AT EBINI

Category	Opening Stock	Births		Re-classified		Sales	Deaths	Slaughter	Transfers		Missing	Recovered	Closing Stock
		m	f	Out	In				Out	In			
Breeding Bulls	18									4			22
Breeding cows	305				48		5			12		9	369
Male weaners	53			53	77				14				63
Female weaners	29			29	77								77
Heifers	48			39									9
Replacement C.	0				20								20
Replacement B.	1				5	1							4

Calves	155	72	64	155			1						136
Steers	1				48			11	25				12
Total	610	136	6	276	275	1	6	11	39	16		9	712

Small Ruminant Section

Table 19. shows the breakdown of the activities in the small ruminant section for the year 2018. The increment shown in the sheep section was from births. 30 BBB were transferred off the station. 28 for sales and 2 breeding rams for the Mon Repos farm.

The average birth weight of lambs was 3.2kg, animals were weaned at 13.5kg and marketed at an average weight of 35kg.

The section experienced a 21% mortality in lambs and 64% mortality in weaners. The mortality in these lambs after keen observation came from animals being on pastures where worm burden was high, poor animal husbandry practices, feed not being supplied and the stress of early tagging. These observations were taken into consideration and pregnant animals were moved to a dryer area for lambing. Lambs and ewes were treated after lambing and extra care provided. The average daily gain recorded were 0.12kg vs 0.132 kg for female and male lambs respectively. Barbados Black Belly lamb's ADG in the region (Caribbean) is recorded at a high of 0.133kg

In 2016 the average weaning weight for BBB was 14.09 kg, 2017 it was 13.45 and 2018, 15.48 kg. In 2017 it took an average of 90 days to reach weaning weight whilst in 2018 an average of 84 days was taken.

For 2018 there has been 23 sales in sheep which the station earned one million two hundred and eighty thousand, eight hundred and seventy dollars (G\$1,280,870).

TABLE 19: STOCK FOR SHEEP AT EBINI

Category	Opening Stock	Births		Re-classified		Sales	Deaths	Transfers		Missing	Recovered	Closing Stock
		M	F	Out	In			Out	In			
Breeding Rams	7						1	2				4
Breeding Ewes	118				31		10					139
Lambs	28	55	61	80			24					40
Replacement Rams					30			28				2
Replacement Ewes				31	37		6					
Weaner Rams	38			30	37		36					9
Weaner Ewes	40			37	43		36					10
Total	231	55	61	178	178		113	30				204

TABLE 20: STOCK COUNT FOR GOATS AT EBINI

Category	Opening Stock	Births		Re-classified		Sales	Deaths /Ratios	Transfers		Missing	Recovered	Closing Stock
		M	F	Out	In			Out	In			
Breeding Bucks	0											0
Breeding Does	10											10

Rep. Bucks	0												0
Rep. Does	0												0
Weaned Males	1												1
Weaned Females	1												1
Kids Male	2												2
Kids Female	1												1
Total	15												15

TABLE 21: STOCK COUNT FOR HORSES AT EBINI

Category	Opening Stock	Births		Re-classified		Sales	Deaths / Ratios	Transfers		Missing	Recovered	Closing Stock
		M	F	Out	In			Out	In			
Mares	3						1					2
Stallions	2											2
Total	5											4

These horses were treated and are being fed supplements. Currently there is only 1 horse that is fit for riding the others have serious back problems. Cowboys are complaining that the saddles bought are not good for working

Pasture and Nutrition Management

In keeping with the 2018 work program in January the activities were to:

- To Establish by December 2018 a National Repository of Forages.**

- Select site for National Repository
- Sourcing of planting material
- Planting of material

Status: The site has been selected and the sourcing of planting material is ongoing. Land has also been prepared and 4 plots of Grasses have been planted namely: *Panicum maximum*, *Giant king grass*, *Argentina Bahia*, *Sorghum* and *Brachiaria brizantha*

- To introduce 2 forage species to the ELBRS by December 2018

A 10-day training session was conducted with Dr. Macoon on the station where plots were created and king grass and sorghum were planted for evaluation.

HUMAN RESOURCE UNIT

Introduction

The Office of Human Resources (HR) provides services and support to the staff of the Guyana Livestock Development Authority in ways that embrace the Authority's mission. The staff seeks to provide benefits to employees that promote health, wellness, and a sound work/life balance. Through employee orientation and professional development, we attempt to foster the values of inclusiveness, camaraderie, long-term employee engagement, and life-long learning. In all areas of work, the Office of Human Resources firmly upholds the tenets of confidentiality, accountability, and trust.

The Human Resources Department is responsible for effectively ensuring that the immediate Supervisors carry out their monitoring and coaching responsibilities. It is responsible for staff management, development and implementation of human resource policies and procedures, education, training, including in-service training and liaising with relevant teaching and training agencies.

It is in the best interest of the Authority and its employees to have written personnel policies to help the organization meet its mission, to prevent misunderstandings and problems, and to ensure that all employees know what is expected of them. It is essential that all members of management understand the role these policies play in meeting the Authority's objectives and in limiting its legal exposure.¹

The staff in Human Resources assists applicants and employees with all phases of the employment process. We oversee recruitment, interviewing, testing, background checks, selection and evaluation of administrative, part time and fulltime employees while also assisting and advising to the Office Chief Executive Officer

TABLE 22: STAFF EMPLOYED FOR 2018

▪ The following persons were employed during the period January to December, 2018			
Clerical & Office Support			
1.	Phaleena Sowdagar	Human Resource Clerk	2018-04-23
2.	Marion Bollers	Accounts Clerk	2018-08-22
3.	Sasha Roberts	Stores Clerk	2018-08-02
4.	Liloutie Dyal	Records Clerk	2018-11-13
Senior Technical			
1.	Abiola Douglas	Livestock Extension Officer	2018-09-03
2.	Roxanne Langevine	Livestock Extension Officer	2018-09-03
Other Technical & Craft Skilled			
1.	Rae Dawn Nedd	Research Assistant	2018-05-07
2.	Charles Henry	Livestock Extension Assistant	2018-09-01
3.	Shennel Singh	Livestock Extension Assistant	2018-09-01
4.	Bianca Marques	Livestock Extension Assistant	2018-09-01
5.	Shane Fullerton	Livestock Extension Assistant	2018-09-01
Semi-Skilled Operatives and Unskilled			

¹ Guyana Livestock Development Authority Human Resources, Policies and Procedures Manual

1.	Dindyal Reddi	Driver	2018-01-03
2.	Indrani Singh	Cleaner	2018-01-15
3.	Toolsie Willie	Security Guard	2018-04-03
4.	Nandkumar Gopaul	Driver (Tractor)	2018-04-09
5.	Nkosi Batson	General Worker	2018-06-13
6.	Linden Dennis	General Worker	2018-06-03
7.	Dale Lafleur	General Worker	2018-06-20
8.	Devar Bhikham	Security Guard	2018-07-03
9.	Mahadeo Hari	Security Guard	2018-07-03
10.	Sasenauth Ramsarran	Security Guard	2018-07-30
11.	Parasaram Motielall	Security Guard	2018-08-24
12.	Cowlyn Peters	General Worker	2018-09-01
Temporary Staff Recruited			
<ul style="list-style-type: none"> Sasha Robert, Data Entry Clerk, provided services during the period 2018-01-02 to 2018-06-05 			

TABLE 23: STAFF ASSIGNED FROM MOA 2018

1.	Melryc Walters	Livestock Ext. Assistant	2018-10-01
2.	Martique Williams	Livestock Ext. Assistant	2018-10-01
3.	Ronique Bremner	Livestock Ext. Assistant	2018-10-01
4.	Akeem Campbell	Livestock Ext. Assistant	2018-10-01
5.	Kurt Daniels	Livestock Ext. Assistant	2018-10-01
6.	Joel Halley	Livestock Ext. Assistant	2018-10-15
7.	Zahid Ameerally	Livestock Ext. Assistant	2018-10-15
8.	Verlhy Huntley	Livestock Ext. Officer	2018-12-03
9.	Trishanna Alleyne	Livestock Ext. Officer	2018-12-03
10.	Lashon Thomas	Livestock Ext. Officer	2018-12-03

TABLE 24: STAFF PROMOTION 2018

Staff Promoted	New Designation	Date
Paul Chase	Livestock Extension Officer	2018-01-02
Shonette Profitt	Livestock Extension Officer	2018-01-01
Ava Klass	Livestock Extension Officer	2018-01-02

TABLE 25: STAFF RESIGNED 2018

Dharmendranuth Ramnauth	Livestock Extension Officer	2018-01-17
Mariel Savory	Veterinary Officer	2018-07-31
Wandea Bacchus	General Worker	2018-07-01

TABLE 26: STAFF DISMISSED 2018

Rooplall Ramlochan	Security Guard	2018-05-08
Keanu Harry	Accounts Clerk	2018-08-16
Jitindra Persaud	Security Guard	2018-01-26

TABLE 27: STAFF TERMINATED NON-RENEWAL 2018

Jospeh Buchan	Security Guard	2018-03-05
Michael Deen	Driver (Tractor)	2018-03-11
Rabindranauth Tejpaul	Driver	2018-07-07
Fareena Dindyal	Livestock Extension Assistant	2018-08-31
Mario De Sa	Veterinary Officer	2018-09-11
Malchand Inderaj	Driver	2018-12-11
Timothy Latchman	General Worker	2018-12-04

TABLE 28: TERMINATION –NON-RENEWAL (ASSIGNED STAFF), 2018

Eric Joseph	Livestock Extension, Officer	2018-09-03
Navindra Sookmangal	Livestock Extension Officer	2018-09-03
David Wong	Livestock Extension Assistant	2018-09-01

TABLE 29: STAFF RESENT TO MINISTRY OF AGRICULTURE 2018

Mark Hope	Livestock Extension Assistant	2018-06-15
Kenyatto Layne	Livestock Extension Officer	June 2018
Geron Scotland	Livestock Extension Assistant	2018-06-29

TABLE 30: STAFF TRANSFERS, 2018

Transfers and Assignment of Staff to Various Regions

The following staffs were assigned to the Regions stated against their names during the period under review:

<i>Name of Officer</i>	<i>Designation</i>	<i>Date of Transfer</i>	<i>From</i>	<i>To</i>
Randy Storm	Veterinary Officer	2018-05-22	Region 10	Region 4
Richard Mc Donald	Livestock Extension Officer	2018-07-09	Region 10	Region 3
Stefan Hilken	Quarantine Inspector	2018-06-18	Hatchery	Region 9
Kimberly Coppin	Livestock Extension Assistant	2018-07-09	Region 5	Region 10
Marissa Husbands	Livestock Extension Assistant	2018-06-18	Hatchery	Region 6
Tia Williams	Livestock Extension Assistant	2018-05-22	Region 3	Hatchery
Odelia Hilken	Livestock Extension Assistant	2018-07-09	Region 10	Hatchery
Kevon Marcus	Livestock Extension Assistant	2018-07-09	Region 10	Region 3
Leah Kersten	Livestock Extension Assistant	2018-08-08	Region 4	Region 5
Joel Barker	General Worker	2018-05-22	Hatchery	Livestock Farm
Donnet Andrews	General Worker	2018-05-22	Hatchery	Headquarters
Timothy Lutchman	General Worker	2018-05-22	Livestock Farm	Hatchery
Bevis Daniels	General Worker	2018-05-22	Livestock Farm	Hatchery
<i>Name of Officer</i>	<i>Action</i>	<i>Movement</i>	<i>Effective Date</i>	
Denel Hilken	Assignment	Region 9	2018-06-04	
David Pusslewhyte	Assignment	Region 7	2018-07-15	
Colvin Alfred	Assignment	Region 2	2018-01-15	
Carlos Rahaman	Assignment	Region 9	2018-07-15	
Keishawn Mc Pherson	Assignment	Region 4	2018-07-02	
Ronaldo Pancham	Assignment	Region 8	2018-01-15	
Yannick Simon	Assignment	Region 1	2018-01-15	
Carmelita Flemming	Assignment	Region 5	2018-07-09	
Jomal Johnson	Assignment	Region 9	2018-01-15	
Kelisha Mullin	Assignment	Region 4	2018-01-02	
Previpaul Deonarine	Assignment	Region 4	2018-01-02	
Rushana Whyte	Assignment	Animal Health Unit	2018-01-02	
Anastasia Mendonca	Assignment	Epidemiology	2018-01-02	
Juma Bobb	Assignment	Ebini	2018-07-03	

Training and Development

The Guyana Livestock Development Authority (GLDA) in recognizing the need for a lifelong commitment is continuously looking for training opportunities for staff as a consequence a number of staff members have participated in various workshops and seminars both locally and overseas

TABLE 31: LOCAL TRAININGS 2018

NAME	TRAINING/ MEETING/ WORKSHOP	DATE	Organisation
Oma Nickram	Personnel Practice and Policies	April 10-12, 2018	Public Service Ministry
Natalie Smith	Principles of Professional Secretarial Practice (Module 1)	April 16-20, 2018	Public Service Ministry
Stafan Hilken Donette Andrews	Customer Care	April 24-26, 2018	Public Service Ministry
Oma Nickram	Personnel Practice and Policies (module II)	May 8-12, 2018	Paraguay
Curtly Critchlow Eric Joseph	Monitoring and Evaluation	June 11-15, 2018	Public Service Ministry
Robin Grimes Keanu Harry	Government Accounting Procedures	June 19-21, 2018	Public Service Ministry
Dr. Tihul	Training on Highly Pathogenic Avian Influenza Risk Base Surveillance Protocol and Design	June 19-23, 2018	Jamaica
Abiola Bruce	Sustainable Animal Production and Resource Management for Sustainable Agriculture and Food Security	2018-07-03 to 2018-07-28	Thailand

TABLE 32: OVERSEAS TRAININGS/ SEMINARS/ WORKSHOPS 2018

NAME	TRAINING/ MEETING/ WORKSHOP	DATE	Country
Renee Turney Joel Dilchand Kellisha Edwards	Basic Veterinary Science	January 15-February 02, 2018	Trinidad and Tobago
Renita Lashley Zena De Freitas	Third (3 rd) Session of the Guyana- Barbados Joint Commission- Pig Artificial Insemination and Fish Handling Training	February 19-23, 2018	Barbados
Mapeara Thomas	Study Tour Abattoir, Meat Inspection and Slaughtering	February 11-15, 2018	Suriname
Dwight Walrond	Strategy Session to address key Code Chapters being proposed for adoption by the World Organization for Animal Health (OIE)	April 24-26, 2018	Costa Rica
Dwight Walrond	Consultation and Validation Workshop-Program for the Strengthening of Agricultural Health Systems- prevention, surveillance and control of pests and diseases (livestock, fisheries, aquaculture, forestry and crops) in Latina America and Caribbean Region	April 5-6, 2018	Panama
Dane Hartley	24 th Session of the CODEX Committee on Residues of Veterinary Drug in Food	April 23-27, 2018	Chicago USA
Shellon David	Climate Change and Agricultural Sustainable Development	May 10-May 30, 2018	China

Randy Storm	IICA Canada 2018 Research and Internship Assistance Program for Researchers and Academics and for Farmers and Agri-Business Leaders	May 20- June 9, 2018	Canada.
Zena De Freitas Jameila Bisram	Training on Livestock Poultry Breeding and Farming for Developing Countries	June 28-July 26, 2018	China
Terresa Jacobs Wilton Fordyce	Training Course on Livestock Raising and Management for Developing Countries	September 3-30, 2018	China
Roxanne Langevine Paul Chase	Training Course on Bio- Gas Technology in the Treatment and Utilization of Agriculture Waste for Developing Countries-	August 3-23, 2018,	China
Colbert Bowen	Eighteenth meeting of CVO, Thirteenth Meeting of the Steering Committee of the Caribbean Animal Health Network (CaribVET))	June 11-14, 2018	Antigua and Barbuda
Joel Dilchand	2018 Emergency Poultry Disease Response (EPDR) Certificate Training Program- University of Delaware.	June 17-23, 2018	United States of America
Dane Hartley and Johaine Mc Alister	Highly Pathogenic Avian Influenza Emergency Management Workshop in Guayaquil	August 14-16, 2018	Ecuador
Hamwantie Nauth	Participated in the Caribbean Sub-regional Workshop on Prudent Use of Antimicrobials in Livestock	October 23-24, 2018	Port of Spain Trinidad and Tobago
Dwight Walrond	24 th Conference of the OIE Regional Commission of the Americas,	November 19-23, 2018.	Punta Cana, Dominican Republic

FINANCE UNIT

TABLE 33: BUDGET VS ACTUAL FOR 2018

Particulars	2018		2018		
	<u>January-December</u>	<u>January-December</u>	<u>Variance</u>	<u>Variance</u>	
	<u>Budget</u>	<u>Actual</u>	<u>\$</u>		
			<u>Actual / Budget \$</u>	<u>%Actual / Budget%</u>	
<u>Income</u>					
Subvention - Current	545,000,000	563,385,910	18,385,910		
AI Services	403,000	367,500	(35,500)	-9%	Adverse
Sale of Ducklings	16,503,000	15,983,250	(519,750)	-3%	Adverse
Farmers Eggs (Hatching Services)	16,803,000	17,914,800	1,111,800	7%	Favourable
Other Services	999,000	797,800	(201,200)	-20%	Adverse
Veterinary Health certificates	24,001,000	28,647,821	4,646,821	19%	Favourable
Veterinary Services	100,000		(100,000)	-100%	Adverse
Laboratory Fees	3,213	347,000	343,787	10700%	Favourable
Livestock Sales	11,998,000	13,728,490	1,730,490	14%	Favourable
	615,810,213	641,172,571			
Other Agencies / Refund	-	7,153,151			
	615,810,213	648,325,722	25,362,358		
<u>Expenditure</u>					
Salaries, Gratuity & Vacation Allow.	392,000,000	395,617,826	(3,617,826)	-0.92%	Adverse
Other Direct Labour Costs (Overtime)		-	-		
Benefits and Allowances	-		-		
Drugs and Medical Supplies	13,201,131	5,742,669	7,458,462	56.50%	Favourable
Field Materials and Supplies	36,160,282	35,266,109	894,173	2.47%	Favourable
Office Materials and Supplies	5,788,539	3,745,663	2,042,876	35.29%	Favourable
Print and Non-Print Materials	5,300,932	6,411,519	(1,110,587)	-20.95%	Adverse
Fuel and Lubricants	20,655,448	18,820,003	1,835,445	8.89%	Favourable
Rental Of Building	1,680,000	2,003,120	(323,120)	-19.23%	Adverse
Maintenance of Buildings	13,363,753	13,215,911	147,842	1.11%	Adverse
Janitorial and Cleaning Supplies	3,600,417	3,844,939	(244,522)	-6.79%	Adverse
Maintenance of Roads	-				
Maintenance of Bridges	-				
Maintenance of Drainage & Irrigation Works	-				
Maintenance of Other Infrastructure	4,924,880	5,883,548	(958,668)	-19.47%	Adverse
Local Travel and Subsistence	11,358,654	7,987,574	3,371,080	29.68%	Favourable

Overseas Travel	-	2,918,228	(2,918,228)		Adverse
Postage, Telex and Cablegrams	300,000	76,345	223,655	74.55%	Favourable
Vehicle Spares and Services	16,259,402	22,841,714	(6,582,312)	-40.48%	Adverse
Other Transport, Travel and Postage	2,750,160	8,125,214	(5,375,054)	-195.45%	Adverse
Telephone Charges	3,401,500	4,140,372	(738,872)	-21.72%	Adverse
Electricity Charges	37,260,000	36,353,170	906,830	2.43%	Adverse
Water Charges	972,000	73,619	898,381	92.43%	Favourable
Security Services	8,600,000	11,220,744	(2,620,744)	-30.47%	Adverse
Equipment Maintenance	7,158,197	6,697,635	460,562	6.43%	Favourable
Cleaning and Extermination Services	4,120,129	4,094,343	25,786	0.63%	Favourable
Other	7,269,897	9,561,970	(2,292,073)	-31.53%	Adverse
National & Other Events	11,500,000	10,914,496	585,504	5.09%	Favourable
Dietry	-		-		
Refreshments and Meals	6,000,000	5,477,324	522,676	8.71%	Favourable
Other	2,000,000	3,557,522	(1,557,522)	-77.88%	Adverse
Education Subvention & Grants			-		
Training	11,300,000	7,590,105	3,709,895	32.83%	Favourable
	626,925,321	632,181,682	(5,256,361)	-0.84%	Adverse
Non Current Assets	-	9,828,278	(9,828,278)		
Monitoring of outbreak Region#1	-	5,002,961	(5,002,961)		
FAO Expenses		3,282,006	(3,282,006)		
F&MD Exercise		1,669,582	(1,669,582)		
Total	626,925,321	651,964,509	25,039,188	103.99%	
	(11,115,108)	(3,638,787)			

APPENDIX

Consultant Final Report:

TITLE: Pasture Research Project for the Guyana Livestock Development Authority (GLDA)

Consultant: Bisoondat Maccoon

Background

The Sustainable Agricultural Development Program (SADP) is a six-year project that was developed by the Ministry of Agriculture (MoA) of the Cooperative Republic of Guyana to help expand and contribute to the MoA strategy for the development of Guyana's agricultural sector. This project was conceptualized to address the problem of low productivity facing agricultural production in Guyana. Support for the execution of the SADP was made possible by financing received by the Government of Guyana from the Inter-American Development Bank. The project is being executed by the MoA through the Agriculture Sector Development Unit (ASDU).

The Initial Report of the SADP reported that, according to an FAO report of 2012, agricultural production most of the agricultural produce of the country comes mainly from small farmers (ranging from 40 to 80% of total country production for a number of commodities). For the sake of brevity and to avoid redundancy of information, details of that report will not be repeated in here. It must be highlighted, however, that the SADP Initial Report underscored that productivity is considered low compared to similar farm production systems. Yields of crops, such as corn, beans, and small-scale rice, and livestock including poultry, cattle, and small ruminants are approximately 40% less than the average for Caribbean countries. In addition to the challenges to improve productivity, Guyana, like the rest of the globe, has to consider changes in weather patterns resulting in weather extremes of extended flooding and severe droughts and how this interacts with agricultural production. Based on the occurrences during the last two decades in Guyana, severe drought appears to be the extreme weather condition that is of most concern, especially in the hinterland areas. These weather extremes have deleterious effects on food security and pose enormous risks to farmers, and have become one of the major constraints to agricultural production, both for crops and livestock. Development efforts must consider climate change and its effects on agricultural production by identification of the issues to be faced and technologies that can be implemented to counteract extreme weather conditions.

In addition to improving the inherently low farm productivity and addressing concerns about extremes in weather due to global climate effects, planning for agricultural development also has to consider management systems that ensure environmental stewardship of land resources and provision of ecosystem services. The SADP Initial Report contends that little information is available on regionally appropriate agricultural practices, so obviously this is a void that demands to be filled by using available information on technologies developed for similar ecological systems. Field research will also be need to validate the adoption of existing technologies from similar regions or to develop new approaches where required.

In the conceptualization of the SADP to support the development of Guyana's agricultural sector, it was underscored that most of the country's agriculture is concentrated on the coastlands and is the area under greatest threat to climate change risks, insufficient water availability, and suitable arable land. The MoA strategy for agricultural development is to increase production in the hinterland areas, with emphasis on Regions 9 and 10 that are thought to have more natural resources available. The hope is to accomplish this through scientifically rigorous research programs and expansion of the country's capacity to transfer technologies identified to be suitable for the farming systems.

Objectives of the SADP

Taken verbatim from the SADP Initial Report: "The objective of the SADP is to increase the productivity of the agricultural sector while maintaining a sustainable and climate resilient use of natural resources in Guyana. The specific objectives are to (i) produce high-quality data for the agricultural sector; (ii) increase productivity, especially for medium and small farmers; and (iii) increase sanitary and phytosanitary standards (SPS) and access to meat processing facilities. Higher productivity will also contribute to

reducing pressure on forest and fragile ecosystems, and at the same time, increase incomes for small and medium-sized farmers.

Several indicators to quantify the outcome of the SADP were defined in the Results Framework of the Project. Details are provided in the SADP Initial Report and also the Program Operating Manual (POM) that was published in tandem with the Initial Report. This report focuses on the work of the consultancy that encompasses the staff training and develop and implementation of research programs sub indicators that are part of the Component 2 Indicator: Strengthening of the agricultural innovation and extension system. Among the activities proposed by the POM in Component 2, the activity specific to this consultancy focuses on design and implementation of research programs in livestock (cattle and small ruminants) and pastures.

Consultancy Execution

On the 26th April 2018, a contract for individual consultancy was agreed upon between the Ministry of Agriculture of Guyana – Agriculture Sector Development Unit (the Client) under the Sustainable Agriculture Development Project and Dr. Bisoondat Macoon (the Consultant). The agreements of the contract spelled out the services, term, and other details. Importantly, among those details the Client has designated Mr. Nigel Cumberbatch, CEO of the Guyana Livestock Development Authority (GLDA), as the Client's Coordinator. The Consultant is required to perform the services specified in the Schedule of Research, which was made an integral part of the contract. The Schedule of Research included meeting with personnel of the MoA and GLDA, travel to the Ebini station and meeting with the staff, developing an understanding of problems and issues, develop and discuss a program of work with Ebini staff, and to conduct training for GLDA staff expected to be involved in pasture-based livestock research. Reporting requirements related to the consultancy include submission of a draft report at the end of the training period (submitted 6 July, 2018) and a final report (this document).

The SADP-POM highlights that agricultural research efforts in Guyana are primarily conducted on areas along the Atlantic coast in Regions 2 to 6. The POM emphasized that there is a definite need to develop such capacity in savannas, specifically the Ebini and Rupununi areas, which are considered the new frontier for agricultural development. Grasslands in this area are naturally low quality, hence the dire need for research to improve upon these pasture systems. The basis of this consultancy in in the area of pasture research and development.

The Consultant arrived in Guyana on June 17, 2018. Activities conducted during the initial in-country 3week visit of the consultancy are provided in depth in the Preliminary Consultant Report submitted on 6th July, 2018. Although already submitted as a separate document but in order to ensure easy access to the information in the preliminary report, it is attached as Appendix I. This helps to reduce some redundancy in repeating many of details in this final report. Instead, the activities conducted and issues identified will be highlighted only in order to provide background information for discussion. This final report will provide supplemental information to the work that was conducted during the in-country visit, describe how issues identified and expectations of the consultancy were addressed and a listing of the recommendations that came out of all of this.

On the first work day, visits were held with Mr. Cumberbatch, Chief Executive Officer of GLDA and GLDA personnel to help identify issues that needed to be addressed in moving forward with implementing a research and development program in pasture-based livestock production. In the visit with Mr. Cumberbatch, we discussed his expectations from the consultancy, and what he thought were the priority issues. He emphasized that the staff were in dire need of training on developing and executing pasture research programs, which matched with my pre-conceived ideas and the planning and training module I had done in preparation for the trip. Aside for classroom lectures, Mr. Cumberbatch expected me also to lead the staff in establishment of a forage germplasm nursery collection and trial plots at Ebini. This included training in plot layout and details of what field monitoring and evaluations were needed and how they were to be done throughout the duration of the field studies.

After the discussion with Mr. Cumberbatch, we met with his technical staff and discussed their roles in the institution. I discussed my training and experience and how I felt it was well suited to the requirements of the consultancy. I then asked the technical staff their expectations from the consultancy. Several of the staff members present were to be part of the training program. Many of the comments supported Mr. Cumberbatch's idea that the most immediate need was for staff training in the understanding and execution of research

Issues Identified and Lesson Learned

Cumberbatch: Brachiaria humidicola 'UF 717' is the predominant forage in the Ebini savannas. There should be investigation into the utilization of other forage species. Brachiarias, Panicums, Legumes. Soil fertility studies are integral to the success of forage research. There should be study of animal growth characteristics. Consultant should guide establishment of forage germplasm collection nursery at Ebini and other stations. Provide guidelines for monitoring weed invasion, pest and insect incidence, flowering characteristics, plant height, rate of establishment, recovery from defoliation. Consultant should guide establishment of trial plots. Staff need to learn about experimental plot layout and data collection. Emphasis on training staff in pasture research techniques.

GLDA staff: Preparation had begun for establishment of germplasm nurseries. Ebini had ideas for establishing protein banks (with kinggrass and Panicum maximum; but they will be advised that utilizing legumes will be more appropriate). Plantings have been made of whitey, sijan, and glyricidia, which are trees that may be used as fodder. The plan at Ebini is that these will be used in cut-and-carry systems. The cattle herd size is currently 612 animals

There are plans to utilize B. brizantha and B. decumbens in pastures. The history of digitgrass (pangolagrass) was discussed re: high demand for fertilizer to ensure adequate forage production, lack of fertilizer due to the national economy in that era, pangola stunt virus, etc. UF 717 worked well because of its ability to grow well despite fertilizer limitations. There is need begin looking at forage materials that may be better options than UF 717. Involves looking at soil fertility. Better breeding animals are needed. Lands on the coast are infinite – land demands are prioritized for the rice industry. This makes encouraging moving to and increasing livestock production in the savannas a high priority. Discussion on green economy and sustainable systems, climate change agriculture, conserved forages/silage, and environmental stewardship. Discussion on the cutting frequency study superimposed on a study evaluation biochar amendment effect on kinggrass production. Frequencies were 4-, 6-, and 8-wk harvest intervals. It was discussed that shading effects by the adjacent unharvested plants may have affected the survival of some of the plants harvested for the frequency study. Discussions are ongoing for University of West Indies students to use the Ebini station for practical training. It was noted that university graduates in agriculture rarely ever are employed in the private sector, meaning, they were not employed in high-paying jobs.

Ebini: Large ruminants – post-weaning nutrition may be a problem. Calves show distinct drop in weight gains during this period. Small ruminants – parasite issues; low performance of sheep in terms of weight gain. Questions on if there is a need for separate pastures for bulls; old vs. young vs. steers. Separate pastures for breeds, age groupings of dams? Questions on frequency of soil sampling; suggested that there should be a schedule for soil sampling so that it does not become a burden on labor and budget; details must be worked out. Fertilizer recommendation for pastures? Use of burning as a pasture's management tool?

Training Participants: By their own admittance, participants essentially lacked the knowledge and training to conduct field research. There were very enthusiastic about the program we were about to conduct. The amount of lack of understanding of basic knowledge of science related to carrying out research is staggering. Students did not know how to use data to develop a regression equation, for example. The all took at least an introductory statistics course, yet they did not know why replications were needed in experimentation.

□ It was a gratifying experience to share information and knowledge with these participants, to see them understand things they did not know, and their enthusiasm and their hunger for more information.

Training and Field Exercises

Based on the emphasis placed on training on how to conduct field research, a training program was developed that emphasized the theoretical basis of pasture research techniques, experimental methods, and design and analysis of experiments and field exercises were conducted to provide practical hands-on experience related to the classroom lessons. Frankly, in this first series of training exercises more emphasis was placed on the theoretical lessons simply because it appeared that there was dire need for this and it seemed pointless to have trainees do field exercises without knowing the basis for many of these techniques and approaches. Additionally, much of the lessons from the theoretical/academic training are intended to make the trainees better equipped to understand forage science when they encounter research manuscripts, which hopefully can help with their self-development as scientists working in research, or with translating the knowledge learned from research reports into information suitable for dissemination to extension agents as well as farmers. Appendix II provides comprehensive information of the training done during the consultancy. It is a compilation of the handouts for classroom session, the literature used in developing the lessons, supplemental reading materials to support the classroom lectures, notes of data derived from the field exercises, and examples of statistical approaches used to interpret the data gathered.

Based discussions with the group of trainees prior to starting, I decided that my training style would not follow the traditional classroom lecturer style where visual aids and class handouts were used and the presentation was delivered. Instead, we used a more conversational, group-discussion style, but with the PowerPoint presentation as our cue. This approach took much longer than a traditional lecture (often more than three hours for a one-hour lecture) but both the trainees and I found it to be very useful to do it this way because we were able to clarify many things that they were not familiar with and did not understand. Please see the Consultant Preliminary Report (Appendix 1) for more information about this.

The training provided during this consultancy period was introductory and gave participants an overview of pasture research, how to design experiments, and measurements that are required for small-plot experiments and the grazed sward and how to do the sampling required. Further training must emphasize practical, repetitive field training and collation, analyses, and interpretation of research data. Also, training participants should be exposed to physiological and morphological elements of forage growth for them to understand the “why” of designing treatments for their experiments. By their very nature, forage plants are designed to be defoliated, whether by grazing or cutting. Therefore, most experiments to evaluate forages focus on defoliation intensity and frequency. To understand what levels of these to implement for different forages, morphological and physiological characteristics must be understood to be able to characterize and evaluate forage regrowth mechanisms. Further, training will be required for the animal component of forage research. Trainees will have to develop an appreciation for the plant-animal-environment interactions that take place in pastures systems and to understand how to measure these. Ultimately, pastures systems are designed to provide for animal production, so trainees will have to learn how to incorporate animal studies in to the overall forage research plan. Training must be ongoing throughout the duration of the SADP project

The lecture topics for the training completed during the first consultancy were: □ Options in Pasture Research □ Appropriate Terminology in Forage Research □ Schemes used in Forage Evaluation □ Field Designs in Forage Research □ Measures of Grassland Production: Evaluation of Genetic Lines □ Measures of Grassland Production: Quantifying Productivity of the Grazed Sward □ Quantifying DM harvested and Botanical Composition in Small Plot Clipping Experiments □ Quantifying Productivity of the Grazed Sward □ Quantifying Botanical Composition of the Grazed Sward □ Post-Harvest Handling of Forage Samples
In addition, training included seminar presentations on: □ Practical Considerations in Designing a Grazing System □ An Alternative Legume Management System

Several field exercises associated with designing and laying out of experiments and measuring grassland production, and subsequently, approaches to analysis and interpretation of data collected were practiced. Details are given in the Preliminary Report (Appendix I).

Planned future lecture topics include: Characterization and Evaluation of Forage Regrowth Mechanisms Research Techniques to Describe Relationships at the Plant-Animal Interface Response Variables in Animal Production Studies Fixed and Variable Stocking Rate Experiments Stocking Rate and Grazing Pressure Calculation of Animal Responses Weigh Errors in Liveweight Gain Experiments Measuring Intake on Pastures Estimating Botanical Composition and Nutritive Value of Herbage Accumulated and Consumed on Pastures Supplementation Trials on Pastures

In addition to these planned lectures, practical field exercises and demonstrations will be provided to accompany all of the theoretical lessons. In fact, it is intended that future training will emphasize field exercises much more than classroom activities.

Field Studies Implemented

A field study was established at Ebini to evaluate defoliation effects on kinggrass. Treatments will be harvesting at 4-, 6-, or 8-wk intervals at two cutting height to be determined based on the average length of the internode at the base of the stalk (the intention is to harvest in the middle of an internode so that the stubble has two nodes or at double that height; likely will be approximately 20 and 40 cm).

The experiment was arranged as a 3 × 2 factorial of a randomized complete block design with four replications. Planting was done on 22 (Blocks 1 and 2) and 26 June, 2018 (Blocks 3 and 4) using stem cuttings that had at least three nodes. Imposition of treatments will begin when plants reach maturity height, approximately 2 m.

The establishment of this study was used as an exercise to teach experimental design, plot design, laying out field studies to ensure precise measurements and right angles, and appropriate planting techniques. Use of plot borders and alleyways between plots and blocks and their rationale was discussed. When treatments are to be imposed (planned to coincide with the next consultant visit), use of statistical techniques to conduct randomization and allocation of treatments will be taught. Also, at the same time, measurements to be taken will be explained in detail and a protocol will be developed as part of the training of GLDA staff.

Also, at Ebini, the Consultant participated in the establishment of a forage germplasm nursery. Comprehensive discussions of the rationale for germplasm nurseries, their role in forage evaluation programs, and the responses to be quantified and recorded was part of the classroom training so will not be explained here (see reference materials in Appendix II). The field establishment activities served to further teach the trainees about plot layout and importance of forage germplasm collections.

An existing kinggrass study at Kairuni reportedly had issues with shading effects on adjacent plots when some plots were harvested on different harvest schedules. Also, there were some concerns about the statistical validity of the way treatments were arranged. The Consultant was asked to examine these issues. The GLDA staff working on the project were advised on how to re-arrange treatments in order to account for these limitations.

Recommendations and Plans

Forage Evaluation Scheme:

Part of the Consultant responsibility is to develop a forage research program guided by the SADP project protocol and based on information learned from interactions and comments from personnel, and the consultant agreement. The aim will be to identify better quality forage grasses that may have better quality than UF 717 and are also well adapted to the ecosystem. Additionally, the research program should seek to identify forage legumes that can become part of the pasture systems in the savanna and other ecosystems targeted by the SADP project. An overarching consideration is all proposed forage studies will a focus on environmental stewardship; that is, ensuring that recommended management practices are sustainable and are protective of the ecological balance in the system. This research primarily will focus on developing studies that will inform us on species and cultivar performance of forages that may be adaptable to the

savanna ecosystem. In the longer term, the research will help elucidate pasture management effects on soil quality characteristics and plant growth responses, but it is expected that grassland contribution to ecosystem benefits, such as reduced rainwater runoff and increased water penetration into soil, erosion and nutrient leaching concerns, and wildlife habitat will be enhanced.

Agricultural production faces a monumental challenge to meet the food demand of a world population. To ensure sustainability and protect the earth's resources for future generations, agricultural management should minimize any negative impact on the environment and, importantly, not deplete soil resources. For pasture-based systems, contributing to this balancing act requires an increase in animal output on existing pasture and grazing lands through sustainable intensification of grazing management.

The proposed Forage Evaluation Scheme will have the following phases:

I. Forage germplasm evaluation: will involve establishment of forage germplasm nurseries where the main objective will be to determine adaptation of introduced forage species and cultivars to the environment as well as compare them with already adapted forages. Agronomic measurements will focus on survival, pest and disease tolerance, yield, growth patterns, flowering characteristics, and tolerance to weather extremes. Forage nutritive value and potential for containing toxic compounds will also be evaluated. II. Small plot clipping trials: studies will quantify responses to the environment, fertilizers, defoliation regimes, seasonal growth pattern, yield, and chemical composition. III. Forage response to grazing: defoliation by grazing animals (days' rest, days grazing, grazing intensity), pasture productivity and persistence. Will include chemical composition characteristics measurements. IV. Animal response to grazing: parameters to be evaluated will include pasture carrying capacity and production per unit land area. Some measures of forage nutritive value nutrient digestibility, feed intake, feed conversion, and production per animal, are inherent in these studies. V. Forage-livestock feeding systems: Emphasis will be on pasture management relating to pasture sequence, supplementary feeding, and systems for conserved feeds. Also involves equating animal requirements and forage-feed supply as well as economic efficiency and application to the farm system.

Initially, research will focus on the first two stages and to ensure that it fits within the duration of the project life, will be done concurrently. Forages to be tested will be selected based on known performances from around the region, for example, based on research conducted in similar ecosystems in Brazil and Colombia where forage research is known to be advanced. Based on results from the Stages I and II, experiments at the Stage II level can start by the 3rd year of the project and perhaps even some Phase IV work, depending on the level of success with the small plot testing and the likelihood of new forages to have a large impact on animal performance.

Pasture Management:

Fertilizer studies: Aside from evaluating new and promising forages, small plot studies will also be utilized to evaluate fertilizer application responses on UF 717 and well as other forages. This is mandatory in developing management protocols for forage production, but also there were reports about lack of fertilizer response in existing pastures at Ebini. Fertilizer application practices should be guided by soil tests and plant requirements. One issue is that UF 717 is tolerant of low fertility and in addition, pastures appear to be grazed leniently, so there may not be a need for large applications of fertilizer. Studies will be planned to include varying levels and combinations of N, P, and K fertilizers with or without trace minerals (savanna soils are noted for trace mineral deficiency) as well with or without liming.

Soil sampling recommendations: The issue of best schedule for soil sampling will have to be examined further, mainly because of costs involved. Soil analysis is required to determine chemical characteristics of the soils in various production fields and to guide fertilizer application appropriate for optimum crop growth. Given this, it is mandatory to have soil samples taken in newly planted fields. Substantial change in chemical characteristics is long term so sampling every season is not required.

Often, in intensively managed crop field, soil sampling every 3-5 years is recommended depending on soil type. Agronomic cropping systems remove a substantial amount of nutrients from the system because it is harvested and taken away from the farm. Depending on the crop, most, if not all of the nutrients taken up

in the plant is removed and taken off that site. In dedicated hay production and forage harvested for silage systems, definitely all of the nutrients taken up by the harvested plant material is removed from that field. As a result, fertilizer recommendations are based on the amount of nutrient expected to be removed by the harvest. Getting a soil analysis every 3 to 5 years ensures that the land manager is applying appropriate amounts of fertilizer, not only to achieve optimum crop production but also to ensure that soil nutrient losses are safe guarded, that is, what is being removed is being adequately replaced.

In grazed pastures, fertilizer application is somewhat more complex. During grazing, the animal is removing nutrients when they consume forage plants, but studies show that about 60 to 90% of those nutrients are recycled to the pasture via urine and feces, albeit not uniformly across pastures (in future pasture systems studies, approaches to reduce the non-uniform redistribution of nutrient will be examined). This type of system leads to much longer-term change in soil chemical characteristics; thus, soil sampling and soil analysis can be done at less frequent intervals, perhaps every 5 years but can be longer. In the Guyana situation where cost of soil analyses can be prohibitive, it is recommended that there should be an initial sampling and soil analysis then again after 5 years. At the 5-year sampling, the results of the analysis will be used to examine the extent of changes in chemical characteristics and will determine if future sampling needs to be more or less frequent.

Burning as a pasture management tool: Burning has been used since time immemorial to rejuvenate pastures. It is a means of managing excess residue and can be used to control brush and encroachment of woody plants. Grasses typically are not harmed by burning because their root systems extend deep into the ground. Burning can stimulate growth of unproductive or heavily weed-infested pastures. It is inexpensive means of removing unwanted vegetation. In addition, burning has additional benefits of controlling insects and reducing diseases in conditions where dead biomass could host pathogens. One of the most profound effects of burning on new plant growth is the immediate release of short-term nutrient availability, especially nitrogen mineralization that causes growth flushes.

Although these short-term benefits are well known and often required, it must be underscored that burning has long-term detrimental effects. Perhaps the most important of these damaging effects is the destruction of soil organic matter and nutrients (total nitrogen, total sulfur, carbon to nitrogen ratio, extractable carbon, polysaccharides, ammonium, and available phosphorus) that may have taken decades, if not hundreds of years, to build up in the soil. Removal of vegetation by burning can also lead to decreased potential for water-holding capacity, injury to some desired vegetation (especially to short and shallow rooted grasses), and soil erosion. Heavy rains after burning and before vegetation has established may lead to the beneficial ash being washed out of the field. Thus, burning must be used only if absolutely necessary; it is better to manage pastures to prevent the need for burning.

When it is determined that burning has become necessary, it must be planned under appropriate conditions at the right time of the year. The process will require equipment and crew to keep the fire under control.

The Process:

Define the area to be burned: It is important to define the boundaries, identify location of fences, gates, power lines, etc. that could be affected. Walking the area to identify area of heavy fuel such as matted grass and dead trees that could intensify the blaze.

Timing of burning: Determining the best time to burn is a critical element for obtaining the desired response. Safety and effectiveness depend on the region and climatic conditions. Burning must be timed when the fire can consume dead grass that are reasonably dry but conditions must be wet or rain is expected that will allow for a flush of regrowth. A rule of thumb is to burn at the end of a dry season after the first or second rain of the coming wet season.

Firebreaks must be created: The fire must be restricted to the area to be burned. Ponds, ploughed fields, and roads can be used as firebreaks but most likely a fire break has to be created that is wide enough for control depending the expected extent of the fire. In the savannas, the recommended methods are to plough around the fields to be burned.

Have necessary workforce: This is obvious but cannot really be quantified. It would depend on the size of the area. Very importantly, however, it is necessary to have people on each fire line and no one should work alone; there must be at least two people working together for safety, and more depending on the size of the burn. Generally, three to four people are needed – one to ignite the fire, one or two to control the Fireline, and one to extinguish smoldering debris such as logs or stumps.

Weather conditions: Once the plan is in place and the burning plan has been decided, it is important to monitor the weather conditions several days ahead of the planned burning date. Wind speed is very important and should be less than 24 kph before burning is allowed. The humidity should be at least 25% and ideally between 30 – 55%. Do not take chances if wind speeds are too high! Also, do not burn at night because if nights get cooler layering of warm and cool air can occur and may lead to problems with smoke dispersion.

Fire Ignition: Start by igniting a backfire in the downwind corner of the field. Because a backfire moves against the wind, it is more effective at scorching and killing woody brush and weeds. Beginning a backfire late afternoon or early evening will usually allow a slow ignition because humidity is at its lowest and winds are quietest. It is recommended to lengthen the backfire by igniting short segments of Fireline along the boundary of the burn side that is downwind. Never ignite more fire than the crew can easily control! Pay close attention to potential changes in wind speed and direction, as well as location of members of the crew. Check back along the Fireline to make sure the fire has not re-ignited or crossed the firebreak.

Flank and headfire: Continue burning along the perimeter of the field by igniting flank fires. A flankfire moves at right angles to the wind and burns more quickly than a backfire. Be cautious of wind shifts because these can cause a flankfire to turn into a fast-burning headfire. The backfires and flankfires should create a firebreak, or burned ground, around most of the perimeter of the burned pasture. Then a headfire can be ignited. Headfires can spread quickly, have long flames, and create the most heat.

Because fire escapes usually happen when igniting a headfire, it is recommended that the firebreak be two times wider than the average flames heights before igniting a headfire.

Completing the burn and evaluation: Once the area is burnt, make sure the fire is completely out before leaving. One smoldering ember could re-ignite a fire. Check the perimeter of a burned pasture several times. If burning late afternoon, it is best to wait until dark when it is easier to see any hot spots. Do not bury smoldering debris because they can burn for a long time underground.

Once the work has been done, evaluate the entire process to ensure the objectives were met and the operation was smooth and efficient, identifying where improvements can be made in future exercises. The burn plan should account for starting the fire and completing finishing the burn within daylight hours.

Properly planned and executed burns can be effective management tools for pastures when conditions make them necessary. This must be an occasional practice, however. Repeated long-term use of burning can have permanent negative effects on soil quality and overall soil health. Repeated burning can also lead to long-term reduction in pasture production. It may be several years before detrimental effects of burning on soil fertility becomes evident, and then it will be too late.

Potential Animal Studies:

Post-weaning calf performance: Given the reports of low post-weaning gains, possible causes for low post-weaning calf performance will have to be examined. Possible explanations could be rumen physiological development and/or nutrition. The production records will have to be examined and discussion with staff will have to be more detailed to determine exactly what are the management practices, specifically as it relates to time of weaning, how weaning is done, how much separation there is between calves and dams in the days immediately after weaning, and feeding management. Additionally, data on calf birth weights and weaning weights from existing records will have to be summarized to determine daily growth rates, and subsequent rate of daily weight gain in the months from weaning to animal maturity (market weight for steers or breeding weight for heifers) will have to be considered. Based on this, it will be determined if research is required or if management changes can be suggested. Currently, sufficient information has not been summarized to plan potential research studies.

Internal parasite control in small ruminants: Staff are concerned that research is needed to determine suitable management to control internal parasite loads in sheep and goats. Before studies are planned, however, baseline information on current management practices and anthelmintic use. Perhaps the parasite control protocols being used can be improved upon. Personnel should use existing information to develop anthelmintic-use protocols that will encourage use of varied products to reduce parasite resistance and use of rotational stocking and grazing height control as management tools to reduce parasite load. During the next consultant visit, the parasite management will be examined more closely and protocols for parasite load control will be developed together with the staff.

Training

In-house training: It is abundantly clear that the personnel are direly in need training in the conduct of field research. Frequent on-going training using qualified personnel is critical. The lack of sufficient knowledge in conducting research among GLDA is staggering and has to be addressed in order for competent work to be done and reliable research results can be generated. The future of Guyana's agricultural development will be determined by the training the young agriculturalists receive. They have the intelligence and the desire; it is simply that they did not receive the appropriate level of training.

Graduate level training: In tandem with the in-house training, sources of funding must be pursued for sending personnel to do graduate studies. Training at the graduate level is required for personnel to be able to execute research on their own and to mentor untrained individuals.

TABLE 34: FARMERS TRAININGS IN 2018

DATE	VENUE/DISTRICT	TOPICS/SUBJECTS AREAS	# OF FARMERS		RESOURCE PERSONNEL
			EXPE CT.	PRES .	
1/19/2018	Parika back Primary School	Seminar on Cattle Management and Artificial Insemination	25	19	Dr. P. Tihul
					L. Persaud
					T. Hutson
1/30/2018	Canji Secondary School	Demonstration on making MUB and Silage, Discussion on AI and nutritional diseases		35	Dr. S. Nauth
					N. Sookmangal
					w. Fordyce
2/1/2018	Santa Mission	Seminar on Management of Broilers and Black Giant chickens		33	P. Tihul
					S. Anthony
2/5/2018	Apoteri	Animal Husbandry		31	Dr. Andray Pearson
2/6/2018	Rewa	Animal Husbandry		22	Dr. Andray Pearson
2/7/2018	Crash Water	Animal Husbandry		39	Dr. Andray Pearson
2/19/2018	Karasabai	Animal Husbandry		19	Shonnel Singh
2/21/2018	Tiger Pond	Animal Husbandry		21	Shonnel Singh
2/22/2018	Yoreng Paru	Animal Husbandry		18	Shonnel singh

2/23/2018	Taushida	Animal Husbandry		21	Shonnel Singh
3/22/2018	Free and Easy Church of Christ, West Bank Demerara.	Beef Cattle Management and Artificial Insemination	20	14	Mr. Fenton Nickram
					Mr. Pitamber Panday.
3/21/2018	Parika Back Primary School.	The Importance of record keeping.	20	14	Mr. Lalta Persaud.
3/13/2018	Kurutuku	Broiler Management		15	Dr. Mario Desa
3/14/2018	Kurutuku	Broiler Management		18	Dr. Mario Desa
3/15/2018	Kurutuku	Broiler Management		7	Dr. Mario Desa
3/21/2018	Simonie	Construction of corral and chute		12	Dr. Darren Halley
3/22/2018	Katoka	Disease and prevention, Animal Husbandry		14	Dr. Darren Halley
3/23/2018	Yupukari	Animal Husbandry		10	Dr. Darren Halley
3/24/2018	Fly Hill	Animal Husbandry and Pasture Development		12	Dr. Darren Halley
3/25/2018	Kwaimatta	Animal Husbandry and Pasture Development		14	Dr. Darren Halley
3/26/2018	Pai Pang	Animal Husbandry and Pasture Development		18	Dr. Darren Halley
3/27/2018	Taushida	Animal Husbandry and Record Keeping		24	Dr. Darren Halley
3/28/2018	Kackshibai	Construction of chute and corral and Breeds of cattle		15	Dr. Darren Halley
3/29/2018	Tiger Pond	Disease and Disease Prevention		19	Dr. Darren Halley
5/4/2018	New road Esq. Coast	Best Practices of Poultry Production		8	S. Narine
5/3/2018	Unity E.C.D.	General Management of Small Ruminant			S. Anthony F. Deendial
5/29/2018	Craig E.B.D.	General Management of small Ruminant		16	S. Anthony
					H. Bhagwandin
					T. Mapera
5/17/2018	Three Miles Sec. School	Record Keeping		26	M. Desa
					D. Pusslewhyte
					U. Hernandez

5/28/2018	Monkey Mountain	Rearing Black Giant Chickens		12	A. Pearson
5/29/2018	Yerong Peru	Rearing Black Giant Chickens		10	A. Pearson
5/30/2018	Rukamuta	Rearing Black Giant Chickens		9	A. Pearson
5/31/2018	Tiperu	Rearing Black Giant Chickens		9	A. Pearson
3/5/2018	GLDA Extension Office	Housing and Welfare for pigs	15	11	R.Cameron
17/05/2018		Care and management of pregnant sows and piglets	15	11	R. Cameron
16/05/2018		Making of Molasses Urea Block	4	4	R. McDonald
24/05/2018		Feed and feeding practices	15	15	R. Cameron
2018-06-12	Mr. Ramzie Residence Marais Pleasure, W/naam	Small ruminant's management	25	16	Dr. P.Tihul
					Mr. D. Pusslewhite
					Mr. Hutson
2018-06-20	Goed Intent Community Centre	Care of new born and Farrowing crate construction demonstration	25	24	Mr. Rondell Cameron
					Mr. Pitamber Panday
					Ms. Teshana Fraser
2018-06-13	Now and Never	Introduction to PICSA and the use of CEWS		17	H. Crawford, M. Welch, N. Felix, T. Jacobs, J. Dilchand
6/14/2018	D Edward Village	Introduction to PICSA and the use of CEWS		33	H. Crawford, M. Welch, N. Felix, T. Jacobs, J. Dilchand
6/19/2018	Onverwagt	Production Systems and Housing Designs in Swine Husbandry		24	R. Cameron, Food for the Poor
6/26/2018	Onverwagt	Site Selection and Housing Designs in Swine Production		27	R. Cameron, Food for the Poor

6/27/2018	Now or Never	Demonstration on making MUB and Silage		22	Shellon David
6/28/2018	D Edward Village	Demonstration on making MUB and Silage		20	Shellon David
6/22/2018	Apoteri	Rearing Black Giant Chickens		14	Dr. Halley, Dr. Pearson
6/23/2018	Rewa	Rearing Black Giant Chickens		13	Dr. Halley, Dr. Pearson
6/24/2018	Crash Water	Rearing Black Giant		16	Dr. Halley, Dr. Pearson
6/14/2018	Christiansburg Extension Office	Record Keeping		22	R. Cameron, Food for the Poor
6/28/2018	Christiansburg Extension Office	Housing and Welfare for pigs		22	R. Cameron, Food for the Poor
June 27 th , 2018	GLDA Region #3 Office, Den Amstel WCD.	Cattle management and Pasture Management and Artificial Insemination.	20	10	Dr. P.Tihul
					Mr. P. Mahadeo
					Mr. L. Persaud
July 12 th , 2018	Mr. Ramdass residence Tuschen EBE.	Small Ruminant Management & Disaster Risk Management	25	24	Dr. Tihul
					Mr. R. Mc Donald
					Mr. Lalta Persaud
July 19 th , 2018	Leguan NDC Office	Small Ruminant Management & Disaster Risk Management	25	16	Dr. Tihul
					Mr. R. Mc Donald
					Mr. Lalta Persaud
July 10 th 2018	Fyrish	Green Agriculture, Livestock Emergency		10	Mr. Welch
July 10 th 2018	Fyrish	Measures, silage and molasses urea block making		20	Mr. Welch, Mr. Crawford
July 5 th 2018	Christiansburg	Feed and Feeding Practices for Swine		21	Mr. R. Cameron
July 12 th 2018	Christiansburg	Care and Management of pregnant Sows and Piglets		22	Mr. R. Cameron

8/20/2018	Anna Regina	Demonstration on making Molasses Urea Block		10	Mr. Crawford, Jacobs, Dr. Grant. Alfred, P. Daniels, S. Narine
8/20/2018	Karasabai	Livestock Management		24	Dr. Pearson
2018-08-21	Tiger Pond	Livestock Management		21	Dr. Pearson
2018-08-22	Pai Pang	Livestock Management		32	Dr. Pearson
8/23/2018	Taushida			19	Dr. Pearson
8/24/2018	Kakshebai			29	Dr. Pearson
8/28/2018	Amelia's ward	Demonstration on making Molasses Urea Block		4	GLDA staff
8/28/2018	Industrial Area	Demonstration on making Molasses Urea Block		2	GLDA staff
8/28/2018	Free and Easy	Care and Management of Dairy Cattle	25	17	GLDA
9/4/2018	Santa Mission	Duck Rearing and Health	20	17	GLDA
2018-09-11	Aliki	Bee Keeping	20	18	GLDA
2018-09-11	Berbissbali	Broiler Production and Health	15	13	GLDA
9/23/2018	Crabwood Creek	Silage Making		12	Dr. Nauth, Mr. Sampat
2018-09-	West Canji	Management and record Keeping		11	O. Tim
9/12/2018	Three Miles Secondary School	Poultry Production		48	U. Hernandez
9/19/2018	Monkey Mountain	Livestock Management		28	Dr. Pearson
9/21/2018	Yerong Peru	Livestock Management		19	Dr. Pearson
9/22/2018	Rukamuta	Livestock Management		21	Dr. Pearson
9/23/2018	Tiperu	Livestock Management		17	Dr. Pearson

27/09/2018	Windsor Forest, Community Centre, West Coast Demerara	Pasture and Cattle Management, Artificial Insemination and Health	20	15	GLDA
26/10/2018	Akeem Gaffar Farm (Zeelugt), Abid Hussain Farm (Good Hope) and Khemraj Persuad (Parika Back)	Farmer`s Field Small School, ruminant development.	20	19	GLDA
9/10/2018	Kokshebai	Livestock Care and Management		17	Dr. Darren Halley
10/31/2018	Three Miles Secondary	Slaughter of Broiler Birds		15	U. Hernandez D. Pusselwhyte
11/2/2018	Bartica Learning Resource Centre	Swine Management		7	U. Hernandez D. Pusselewhyte A. Fyffe R. Cameron
11/2/2018		Sample Collection		3	Dr. R. Turney
10/31/2018	Farm Visit Saint`s Farm, GLDA Farm	Dairy Management		15	GLDA Region 3 Staff
11/7/2018	Bounty Farm Timehri	Hatchery Management		16	GLDA Region 3 Staff
12/18/2018	Bartica Learning Resource Centre	Composting	10	6	U. Hernandez D. Pusselewhyte
12/17/2018	Sophia Community Centre	Management of Black Giant Chickens		16	C. Bascom
Total Number of Farmers Trained				1,479	