Animal Diseases Reported by Livestock Farmers in Orellana Province: A Retrospective Observational Study From 2011 to 2019 Period

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Abstract

Background: Animal-derived goods and services are produced by livestock, which is a significant industry in tropical and subtropical regions across the globe. However, few links between productivity and health have been found, which may be attributed to various production methods, environmental changes, and population expansion. It is crucial to understand the present situation with regard to animal diseases. **Methodology:** To characterize all zoosanitary incidents documented in the province of Orellana between 2011 and 2019, a retrospective observational research was developed. To investigate the frequency, yearly, and apparent prevalence rates according to species and pathogen involucrate, descriptive statistical analysis was carried out using SAS v.9.4. **Results:** Out of 353 sanitary incidents, 205 notifications were linked to zoonotic character illnesses (58%). Additionally, neurologic confirmation for wild rabies (81 cases; 23%) and vesicular infections (29 instances) were found in the results. Also, the data on apparent prevalence rates revealed unusual results, although we did identify several possible risk factors that need to be taken into account. **Conclusion:** Thus, our results recommend doing highly organized epidemiological studies using an appropriate size animal sample to ascertain the true incidence and prevalence rates of these indicated diseases.

Keywords: Animal Diseases, Livestock Farmers, Retrospective Study.

INTRODUCTION

The safety of the food supply remains a high priority for consumers, producers, veterinarians, and regulatory agencies. People now live in closer proximity to both domestic and wild animals as a result of rapid environmental changes and human population development.[1] Unfortunately, the natural ecological balance between viruses and their human and animal hosts has been disrupted by this increased contact as well as changes in land use, such as crop production and

Access this article online

Quick Response Code:

Website:
www.jnsbm.org

DOI:
https://doi.org/10.4103/jnsbm.JNSBM_15_3_15

cattle grazing.[2,3] Husbandry animals is a crucial element of productive systems in the tropics and the subtropics. Nonetheless, a considerable correlation has been shown between livestock and poverty. In order to strengthen control measures, it is crucial to understand the existing situation of cattle illnesses and their effects on poverty.[4]

Latin America's livestock industry has expanded annually at a rate (3.7%) that is higher than the 2.1% average growth rate for the world. The demand for meat has climbed by 2.45% overall recently; the demand for chicken is greater (4.1%), followed by the demand for pork (2.67%), while the demand for beef has slightly decreased (-0.2%).[5] A sizeable fraction of the countries in the region are small-scale livestock producers.[5,6] Approximately 4.1 million cattle are spread across the four natural regions of Ecuador: 48.4% in the highlands (milking cattle), 42.4% in the coastal region (dual purpose, beef/milk), and 9.13% in the Amazon region and Galapagos Islands (dual purpose, beef/milk). Livestock is one of the most representative agricultural sector activities in Ecuador.[7] Systems of raising livestock are thought to be the best possible social, economic, and cultural approach to preserving community well-being. Additionally, this practice can meet cultural traditions and beliefs while concurrently preserving ecosystems, promoting wildlife conservation, and providing security for daily food.[5,8-10]

There are still numerous areas where endemic illnesses persist that have catastrophic effects on animal health and affect both domestic and international trade. As such, they pose a serious risk to the health and welfare of animals worldwide; their efficient management is essential for maintaining public health, protecting domestic and global food supply, and reducing rural poverty in developing.[11,12] Observational studies are frequently used to characterize the course of a disease and to pinpoint and examine the impact of risk factors.[13,14] Moreover, researching animal ailments after the fact is a quick and affordable way to figure out the best course of action for managing the illness. As a result, this information is crucial for developing control plans for cattle diseases.[15,16] Therefore, in observational study designs, which link naturally occurring exposures to natural disease, the allocation of study units to intervention groups is not under the investigator's control and cannot be randomized.[17-20]

Because of the significance of livestock activities in the province of Orellana, it is imperative to learn about the state of animal health and whether any diseases exist that could impair an animal's performance, cost producers money, or expose them to risk. Thus, the goal of the current study was to describe diseases that were observed using the retrospective record from 2011 to 2019 based on information about animal diseases that were reported, verified, and made public in official reports by the World Animal Health Information System (WAHIS-OIE), which established and oversees the World Animal Health Information. We believe that having this knowledge would be crucial to comprehending how animal diseases behave, developing relevant and successful local control initiatives, or suggesting new research. All parties involved—producers, researchers, students, and local governments—will receive access to this information.

MATERIALS AND METHODS
Study Location
Location: This study was conducted in the four districts (Cantons) of Francisco de Orellana, Loreto, Joya de Los Sachas, and Aguarico in the Orellana province, which is situated in the northern region of Ecuador's Amazon. According to GADPO[21], the province covers 21.730 km² (18.6%) of the total surface area of 45.47% inside the Amazonian region (RA). The humid tropical rainforest that characterizes the region's climate.[22-24] The average annual temperature is 29.7°C, and there is 2942 mm of rainfall. INEC[7] have an estimated 157.520 thousand peoples in the year 2018. Native Americans (Kichwa, Shuar, and Waodani) make up 31% of the ethnic group; mestizos, or blended descendants of Spanish colonists and indigenous Americans, make up 57.5%); and the tiny Afro-Ecuadorian minority (4.9%) make up the remaining ethnic groups.[21,25]

Livelihoods: Estimates from INEC-ESPAC[26] indicate that Orellana province has 606.307 ha of total agricultural land area, distributed as follows: mountains and forests (485.039 ha), which make up 80% of the land; permanent crops (43.582 ha), which make up 7.2%; other uses (28.049 ha), which make up 4.6%; cultivated pastures (25.162 ha), which make up 4.2%; natural pastures (19.034 ha), which make up 3.1%; transitory crop and fallow (4959 ha), 0.82%. The population density is about 8 people per square kilometer, which is extremely low.[27] There are distinctions between colonos and indigenous practices. The former are mostly focused on small-scale intensive farming systems, while the latter are more varied and involve subsistence farming as well.[27-29] In this sense, López et al.[30] and GADPO[21] have indicated that the primary sources of revenue for producers in the Amazon region are centered in agriculture (56.5%), followed by livestock (10%), and mixed production (30%).

Study Design
The current research was realized in compliance with consensus guidelines to report observational studies of Epidemiology-Veterinary or meta-analysis in epidemiology[13,18,31] that describes methods and process and how must be developed. Consequently, our investigation was fundamentally descriptive limited to measure the frequency of the sanitary events of interest.[32] Therefore, this work was a retrospetive observational study on all animals' diseases notified by livestock farmers during to 2011 to 2019 period. According to the following information flow scheme.1: All sanitary event corresponding to animal diseases presented in livestock farmers were notified to the national zoosanitary authority attendant of animal health. 2: Before 2400 h, they proceed to attend the case. 3: Applying measures such as; interdiction and quarantine of the farm, anamnesis, samples collection, and sanitary surveillance 4: Once the national zoosanitary authority through laboratory

analyses have confirmed the case notified, the results were informed to OIE, and they divulge formal reports in the interface to WAHIS-OIE (www.oie.net) as shows the Figure 1.
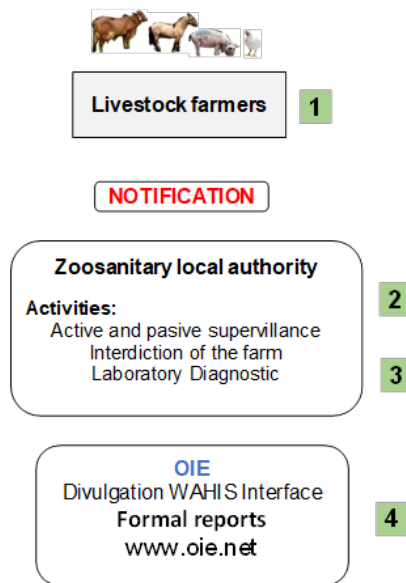

Figure 1: Flow Diagram for Data Obtained to Perform the Retrospective Study about Zoosanitary Status to the Livestock Farmers in Orellana Province.

Data Collection Process and Analysis

All data to confirmed cases of animal diseases presented from 2011 to 2019 period was obtained through the WAHIS-OIE interface and into a Microsoft Excel 2016 (Microsoft, Corporation, Washington, DC, USA) database. They were classified according to species (cattle, buffalo, pig, horse, and poultry). The province of Orellana's productive agricultural units (UPAs) and animal populations from 2011 to 2019 were acquired.[33] Descriptive statistical analysis was conducted using SAS v.9.4 (SAS Institute Inc., Cary, NC, USA) to examine the frequencies and annual patterns according to species and pathogen involucrate according to OIE[34] (mandatory notification diseases) including zoonoses.

Apparent Prevalence Rates (P%)

According to Waltner-Toews[35] and Noordzij *et al.*[36] Prevalence, (P), must be computed as the total number of disease cases or associated characteristics in a particular population, at a specific time, without making a distinction between previous and current cases.

Therefore, the data obtained served to calculate the apparent prevalence rates during the retrospective period from 2011 to 2019. Likewise, the exact confidence interval was calculated according to Brown *et al.*[37].

RESULTS
Animal Population

Table 1. Are summarized the animal total population in Orellana province from 2011 to 2019 period. According to SIPA-MAGAP[33], livestock activity has a crucial role in productive agricultural units (APU′s). Beef cattle are the most representative regarding animal populations than other species of zootechnic interest (equine, pig fattening or poultry). In this sense, the Brahman breed is widely used in this region due to its higher capacity for tropical conditions. Also, livestock farmers are frequently crossing creole animals with Brahman breed and other breeds such as Gyr leteire, Brown Swiss, Jersey, and others, aimed to obtain biotypes most productive. Meanwhile, in general, pig fattening and poultry are breeding in backyard conditions for food security and a few quantities are destined to sell at local markets. The equine species is used to help in the fieldworks for the producers. The data shows from 2011 to 2014 a linear growth on average 13250 ± 1772 of dairy cows. However, 2016 to 2017 was a critical period; low dairy cows num-ber ranged from 5132 to 2960 ± 1772. Possibly, due to economic recession, what obliged the livestock farmers to sell their cows. Regarding categories cattle herd expressed as percentages, all producers try to keep in the category of dairy cows on average 27 ± 5.70 % (from 2011 to 2019) possibly for can contribute to generational replaced of its herd. The calf numbers recorded had fluctuated values between 2011 to 2019 so, this category has demonstrated slight low values 2011 to 2014 period (5390.85 ± 897, on average; 16.3 ± 0.90 %) when compared to the 2015 to 2019 period (7798 ± 897; 17.37 ± 0.90 %). Consequently, it could be explained by the lower dairy cow's birth rate that exists in this region due to poor management (nutrition, reproduction, and management). There is a great percentage of farmers who are dedicated to beef steers breeding all year. Nevertheless, its number slightly decreased between 2012 to 2014 (4900 ± 2033, on average; 15.1 ± 2.8 %) but for the year 2015 quickly recovered similar values (15973 ± 2033, on average; $30.70 \pm 2.84\%$; Table 1). Hence, is herd category indicates the potential that has the breeding of beef steers what might be a profitable, productive alternative but with better management and administration. The heifers, in general terms, should have a higher number than the actual (6925 to 7097 ± 1347; $18.90 \pm 1.60\%$) 2011 to 2019; this would allow has to suitable growth to our herds and be more sustainable and generate significant income. The number of bull's ratio cow: bull in many works for tropical conditions and other factors are ranged from 1 bull for each 60 matures cows (>18 months old). Nevertheless, the recorded of Orellana province of bull from 2011 to 2019 ranged from 3914 to 5000 ± 797; 10.70 to $10.66 \pm 0.93\%$). Consequently, the herd composition has shown many imbalances throughout the retrospective study realized. Although, the buffalo have not been considered a relevant species in productive systems. Nevertheless, the own conditions in this province provide better habitat for its breeding. Anyway, mainly the buffalo is used to extractive activities in palm oil, therefore since 2015 has been recorded and there is data about its population (466 ± 100, on average). Data shows that equines are very utilized to perform activities on the farm regarding other species of zootechnic

interest. In general, this province has not good roads to access the farms. Their number ranged from (3864 to 2137) between 2011 to 2019. Meanwhile, pig fattening and poultry usually are breeding under backyard conditions mainly for subsistence. Nevertheless, the number of poultry according to SIPA-MAGAP[33] has experimented an accelerated growth from 2011 vs. 2019 (5146 vs 16908 ± 6313; 71.62 ± 8.1%) possibly to offer in local markets adopting production forms more intensives. Consequently, this activity has a strong influence on their economy, so we should look for ways to enhance their form of production, focusing on more sustainability and competitiveness.

Table 2. shows the distribution of sanitary events notified by livestock producers and confirmed through laboratory diagnostics by the local zoosanitary authority. In this sense, these have been classified for their relevance[34] as follows; zoonotic, nerologic, vesicular and other. From 2011 to 2019, the livestock farmers have notified 353 sanitary events with diverse symptomatology; 205 notifications were linked to zoonotic character diseases, representing 58% of the total reported. Therefore, infectious bovine rhinotracheitis (IBR) had a high presence about 44% (91 attended and confirmed cases), Bovine viral diarrhea virus (BVDV) with 21% (43 cases), Brucellosis, and enzootic bovine leukosis (EBL) (with 34 cases confirmed every each) 17%. Meanwhile, Leptospirosis only had 1% (3 cases were notified and confirmed) of the total reported as zoonotic diseases.

Table 2: Record of Zoosanitary Events Notified and Confirmed in Orellana Province from 2011 to 2019 Period.

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total	SEM
Zoonotic											
IBR	2	3	7	10	48	3	5	10	2	90	5.2
Bovine viral diarrhea	1	.	4	14	18	-	2	4	.	43	3.3
Brucella spp.	1	1	3	4	4	-	13	3	6	35	1.5
Bovine leukosis	1	-	3	12	18	-	-	-	-	34	5.6
Leptospira spp.	1	2	-	-	-	-	-	-	-	3	0.5
Neurologic											
Bovine rabies	7	10	13	23	11	4	1	4	10	83	8.5
Vesicular											
Aphtose fever	6	1	-	-	-	-	-	-	-	7	2.5
Vesicular stomatitis	8	-	1	1	4	1	1	-	-	16	1.4
Bluetongue virus	-	-	-	-	-	-	-	6	-	6	0.0
Other											
Clostridial septicemia	-	-	-	-	-	-	2	3	3	8	0.3
Equine infectious anemia	1	-	-	-	1	-	2	3	1	8	0.4
Classical swine fever	-	-	7	-	1	6	4	1	1	20	1.2
Avian mycoplasmosis	-	-	-	1	-	-	-	-	-	1	-

Retrospective data from (2011 to 2019) included diseases with features such as; zoonotic, neurologic, vesicular as well as other (grouped). SEM: error standard of the mean
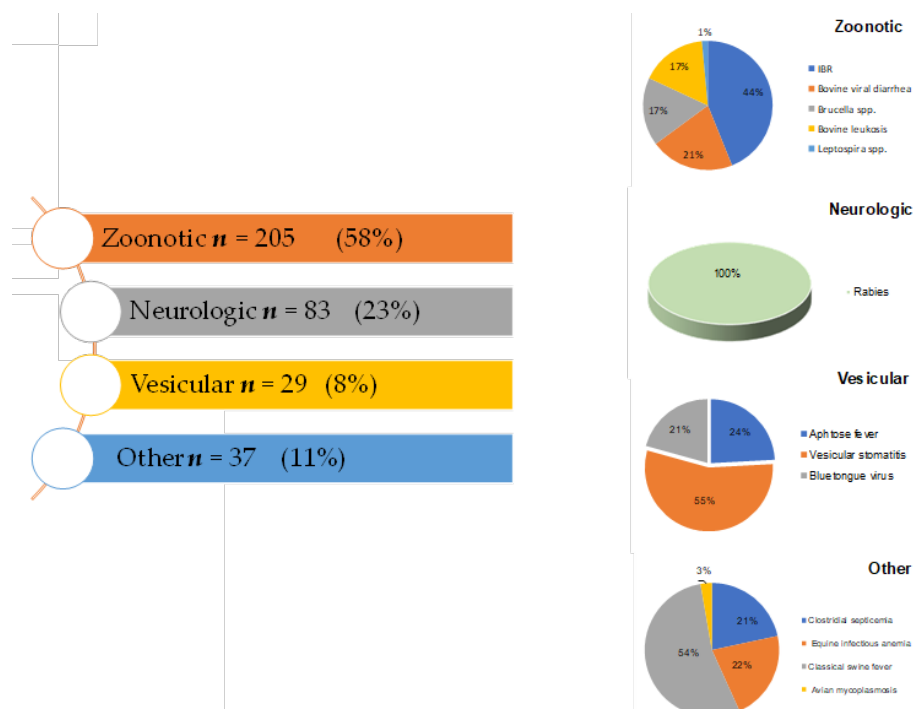

Figure 2: Animal Diseases Notified, Confirmed with Laboratory Analysis, and Taken of Formal Reports of OIE.

On the other hand, according to OIE, from 2011 to 2019, in Orellana province has been attended and confirmed by local zoosanitary authority 81 cases related to neuro-logic symptomatology (wild rabies, 23%) caused sylvatic wildlife species (hematophagous bats) acting as reservoirs and transmitters. Therefore, this disease is present throughout the year due to climate conditions (wet, temperature, and forest), which can be determinants Figure 2. Consequently, rabies is one of the most important zoon-oses globally, with a high impact on public health. On 14 August 2014, Ecuador was declared as a free country to Aphtose fever,[38] therefore, have not been notified cases confirmed from this period (2015 to 2019). Nevertheless, 55% were confirmed to Vesicular stomatitis virus (VSV), 16 cases, as shown in Table 2. Instead, 21% was identified for the Bluetongue virus (BT) 6 cases. By contrast, Classical swine fever (CSF) 55%,8 cases, Clostridial septicemia with 8 cases, 24%, equine infectious anemia (EIA) 21%, 8 cases, and only 3% (1 sanitary event) for Avian mycoplasmosis.

Apparent Prevalence Rates (P%)

In this study, apparent prevalence rates each year were calculated according to the animal population, as shows the Table 3. Consequently, in zoonotic diseases such as; IBR, Bovine viral diarrhea, Bovine leukosis and Leptospirosis, dairy cows were chosen as susceptible livestock population. Our reason is based on the reproductive relevance that has this category in anyone livestock. In this sense, the prevalence calculated was relatively low for all the diseases mentioned. Consequently, IBR demonstrated that, throughout the retrospective 2011–2019 period, prevalence rates varied from 0.02 to 0.01 ± 0.11. Then, an accumulated prevalence was determined (1.55%; 95% CI 1.44 - 1.66%). By contrast, Bovine viral diarrhea, Bovine leukosis, and Leptospirosis in their prevalence rates have shown different behavior. In fact, apparent prevalence rates varied between (0.64%; 95% CI 0.53 – 0.75%: 0.50%; 95% CI 0.39 – 0.61% and 0.02%; 95% CI -0.09 – 0.13%; Table 3). In the same way, another disease of reproductive importance is Brucellosis. To calculate, our team has decided to reference the category heifers of the cattle herd as susceptible population and so can do estimates most accuracy.[39] Hence, have been estimated an accumulated prevalence rate of (0.48%; 95% CI 0.37 0.59%). Regarding this data obtained through the formal reports, all involucrate actors in this activity should analyse carefully the information generated and start to establish line the actions on livestock farmers.

Table 3: Are Summarized the Apparent Prevalence Rates (P) According to Disease Type and the Year of Occurrence in Orellana Province of Ecuador.

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	Cases	P (%)1	CI 95%	p = Value
Zoonotic													
IBR	0.02	0.02	0.05	0.07	1.0	0.06	0.17	0.13	0.01	90	1.55	1.44 - 1.66	0.29
Bovine viral diarrhea	0.01	-	0.03	0.10	0.38	-	0.07	0.05	-	43	0.64	0.53 - 0.75	0.85
Brucella spp.	0.01	0.03	0.05	0.08	0.03	0.01	0.19	0.02	0.07	35	0.50	0.37 - 0.59	0.93
Bovine leukosis	0.01	-	0.02	0.09	0.38	-	-	-	-	34	0.50	0.39 - 0.61	0.80
Leptospira spp.	0.01	0.02	-	-	-	-	-	-	-	3	0.02	-0.09 - 0.13	0.99
Neurologic													
Bovine rabies	0.05	0.06	0.06	0.10	0.14	0.06	0.02	0.04	0.05	83	0.59	0.48 - 0.70	0.92
Vesicular													
Aphtose fever	0.04	0.01	-	-	-	-	-	-	-	7	0.05	0.06 - 0.16	0.95
Vesicular stomatitis	0.05	-	0.005	0.005	0.05	0.02	0.02	-	-	16	0.15	0.04 - 0.26	0.46
Bluetongue virus	-	-	-	-	-	-	-	0.07	-	6	0.07	0.04 - 0.18	-
Other													
Clostridial septicemia	-	-	-	-	-	0.01	0.03	0.02	0.04	8	0.09	0.02 - 0.20	0.87
Equine infectious anemia	0.03	-	-	-	0.03	-	0.08	0.22	0.05	8	0.41	0.30 - 0.52	0.43
Classical swine fever	-	-	0.45	-	0.05	0.51	0.26	0.09	0.09	20	1.44	1.33 - 1.55	0.15
Avian mycoplasmosis	-	-	-	0.02	-	-	-	-	-	1	0.02	-0.09 - 0.13	-

[1](P) Calculated for each year as well as an accumulated apparent prevalence rate (calculated as the number of subjects having the disease at a timepoint/total number of subjects in the population).[36]

On the other hand, in Orellana has been attended by the national zoosanitary authority a total of 81 sanitary events related to neurologic symptomatology Table 2. Rabies was confirmed through laboratory analyses in all cases. Therefore, according to formal reports, the main groups and categories affected are; dairy cows, equines, pig fattening and poultry. In general, Table 2 shows cases from (2011 to 2019), being minimum 1 and a maximum of 23 cases confirmed (0.02 to 0.14 ± 0.01%). Meanwhile, retrospective analyses showed apparent prevalence rates ranged from (0.59%; 95% CI 0.48 – 0.70) Table 3.

From 2013 have not been reported cases of Aphtose fever as show the Table 2. Hence, were only calculated apparent prevalence rates from the 2011 and 2012 period (0.01 to 0.04 ± 0.02), giving a total of an accumulated apparent prevalence rate (0.05%; 95% CI 0.06 – 0.16%). However, sanitary events of stomatitis were reported in equines, whose accumulated apparent prevalence rate was (0.15%; 95% CI 0.04 – 0.26%) during the 2011 to 2019 period. By contrast, in all the retrospective study in this province have only been reported and confirmed through laboratory analyses a total of 6 sanitary events to Bluetongue virus

that were diagnostic in dairy cattle. Consequently, these diseases with vesicular symptomatology nearly have not had much importance. For this reason, our country has a lot of trade agreements with other nations.

In the opinion of the authors of this study have been grouped as other diseases occasioned by Clostridia (septicemia) with a total of 8 sanitary events attended (0.09%; 95%; CI 0.02 – 0.20%; Table 3) calculated on the total of heifers in each year. A similar number there were respect to Equine infectious anemia (8 confirmed cases; 0.41%; 95% CI 0.30 – 0.52%). In the same way, during the 2011 to 2019 period were notified to national zoosanitary authority suspected events related to Classical swine fever (20 confirmed cases through laboratory analyses; 1.44%; 95%; CI 1.33 – 1.55). Nevertheless, it was calculated on the pig fattening population recorded in formal reposts by SIPA-MAGAP[33] as shown the Table 2. Meanwhile, the poultry population in Orellana province has had accelerated growth in the last 8 years (2011 vs 2019; 5146 vs 16908 ± 6313). Nevertheless, have only been informed of 1 sanitary event regarding Avian mycoplasmas (0.02%; 95%; CI –0.09 – 0.13%). All this data found and analyzed we worry a lot, although the prevalence has been lower when compared to other countries. However, these results are important at a local level, and we hope to continue generating information for the livestock producers.

DISCUSSION
Animal Population

Retrospective studies typically make use of pre-existing resources and data since doing so is simpler, quicker, and less expensive. This increases the number of study participants and boosts statistical power.[15,18] Consequently, this work looking better to understand the magnitude of the sanitary events in livestock farmers in Orellana province. Every category of animals, according to SIPA-MAGAP[33], have been explained. A principle that is based on eligibility requirements and technical recommendations for fast risk assessment of risks to animal health.[40]

According to Lemma et al.[41], the animals are always shifting. Due to the increased demand for meat, milk, and milk products, it has a lot of room to grow in emerging nations. However, because of the physical inputs (land, pasture, livestock, labor, and water) and the unique meteorological and geographic variables, tropical locations have very specific production environments. Therefore, the animal population showed marked differences in herd composition when comparing across years and between species. This province is mainly dedicated to beef cattle production under grazing systems.[42] The majority of the milk production in Ecuador is centered on Andes farmers.[43] Furthermore, in this work, we have calculated more significant percentages of dairy cows than the values presented in the coast region (27.8 vs 18.0 %, on average).[44] However, this data cannot be comparable because Orellana province only keeps Brahman breed and crossbreed with creole whose trait is (lower milk production < 4 L vs 12.5 L of milk/d). Whereas cattle on

the coast is devoted to a mixed system of dual-purpose livestock.[45]

Anyway, highlight in this retrospective study an interest event observed along from 2011 to 2019 period. In this sense, have been determined the existence of floating animal population mainly steers Table 1. In fact, this category into to the herd composition shows a growth little unusual from 2011 (7668 ± 2033) when at year 2019 were reported (+162%; 12431 ± 2033). So far, the problem lies in the precedence of these animals, we can be sure of its sanitary status, or in turn, is a population that introduce other agents that could be provoking diseases little frequent in this province. On the other hand, there has been much speculation respect to border zone with other countries such as (Colombia and Peru). Unfortunately, there is not information that might be referenced and allow contrast our hypothesis.

Animal Diseases

This research is the first to explore information about sanitary status to the live-stock farmers through a retrospective study from 2011 to 2019 period in Orellana province. However, our team are conscious of all limitations in this type of studies. The recorded data have been contrasted sneaking up through reliable sources.[34,38] Therefore, these results are formal reports confirmed by laboratory analyses and free divulgation. Forecasts for 2050 indicate that there will be 9.7 billion people on the planet, which will provide significant issues in providing for basic needs like housing and food while maintaining the health of the ecosystem.[3,46] Food security is therefore still a top concern for vets, producers, consumers, and government agencies.[5] Livestock infectious illnesses pose a serious danger to animal health and welfare worldwide.[11] Also, Bonds et al.[47] have established a limited correlation between infectious diseases and poverty, creating intricate ecological agents.

The rise of zoonotic diseases has posed a challenge to the security of public health worldwide in recent times.[48] OIE-WAHIS[38] has already stated that 70% of public health emergencies in Latin America and the Caribbean (LAC) for the year 2007 were categorized as zoonoses. From the study, 204 zoosanitary events in Orellana province were recorded and broadly grouped into zoonotic diseases. IBR had a more significant number of confirmed cases (90 attended zoosanitary events) from 2011 to 2019. Despite rarely has been reported abortion or respiratory infections in cattle. It appears that the immunocompromised animals spread the virus to either young animals (heifers and calves) or to cattle that have not been exposed to it.[49] Another disease of relevance zoonotic confirmed in this province is BVDV[50] notified and confirmed cases through laboratory analyses). Its similarly behaved is unnoticed, not symptomatology observed. Nonetheless, scientific data indicates that the illness is more difficult to measure because it depends so much on the moment when a particular animal initially contrasts.[50] Similar to this, the virus is mostly disseminated by persistently infected

(PI) cattle, who are infected during pregnancy between 40 and 120 days and release a significant amount of virus into the environment after delivery.[51,52] Because of this, their impacts on reproductive performance are far more widespread and can result in several small declines in the likelihood of becoming pregnant or failing to conceive. [50,53] Anyway, Van Roon *et al.*[52] have mentioned risk factor cattle movement (e.g., sale and exchange of animals). It could explain in part our hypotheses about the floating animal population observed (steers into the category of herd composition), as shown the Table 1.

Furthermore, a similar number of zoosanitary events on Brucellosis and Bovine leukosis have been informed by the national zoosanitary authority (34 cases every each) Table 2. In terms of the past, Brucellosis was a zoonotic illness linked to the ingestion of meat, milk, or byproducts of both.[3] Similarly, because dairy farmers run the danger of contracting zoonotic diseases, it has been called an occupational disease.[4,55] In our conditions, the livestock is developed in productive agricultural units at different levels of technification. Consequently, raising cattle could be regarded as a major occupational risk factor for transmission. Finally, leptospirosis is the final illness noted in official reports. However, it has been noted that excessive rainfall may have a substantial impact on the transmission of this aquatic disease.[56] Nevertheless, it is not restricted to tropical regions.[57] Humidity and warmth are critical for survival outside of the host.[56] The environment of tropical and subtropical Latin America is characterized by high temperatures, a lot of natural watercourses, and a lot of rainfall—all of which are conducive to the spread of leptospirosis. According to OIE-WAHIS[38], from 2011 to 2019, Orellana has only been confirmed 3 zoosanitary events. Despite what many local informants (technicians, veterinarians, and other key peoples) have mentioned as a silent disease, their argument is aimed at the high rainfall recorded (> 2500 mm);[22] however, there are no studies in this zone. Therefore, it could not be divulgated due to only a hypothesis not verified, and there is no scientific evidence about this topic in Orellana province.

Table 1: Number and Type of Livestock in Orellana Province of Ecuador from 2010 to 2019 Period.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	SEM
Beef cattle herd[1]										
Dairy cow	11575	12744	15430	13424	4701	5132	2960	8633	16841	1772
Heifers	6925	3033	5893	5180	13593	6691	6929	14586	7097	1347
Calves	6498	3796	5347	5922	10927	5642	5786	11102	5533	897
Steers	7668	2796	5694	6210	15973	9500	10067	21527	12431	2033
Bull	3914	1817	3672	3901	6267	4359	4859	9948	5000	797
Buffalo	-	-	-	-	663	309	311	705	341	100
Total	36580	24186	36036	34637	52124	31633	30911	66501	47243	4611
Other species[2]										
Horses	3864	3149	4579	8786	3061	1194	2430	1377	2137	813
Pig fattening	1148	731	1565	2510	2109	1180	1550	1137	1160	195
Chickens	5146	3656	8192	6665	42000	45835	43918	27520	16908	6313
Total	10158	7536	14336	17961	47170	48209	47898	30034	20205	5934

[1]Standardisation to stock Unit (SU) system according to Parker[54]. Dairy cow: 1; Calves;0.6; Steers 0.7; Bull:1; bull:1; Heifers:0.7 and Dairy cow:1. 2Tropical Livestock Units (TLU) Horses:1.02; Pig fattening: 0.2 and chickens:0.01 according to (30). Sources: SIPA-MAGAP[33]

Certain diseases are transmissible between species, which can impact biodiversity, alter animal population composition or behavior, or even push certain species to extinction.[46,58] The RNA virus family *Rhabdoviridae* is the cause of the zoonotic disease rabies, which is spread throughout the world.[59,60] There are two distinct epidemiological patterns for rabies: sylvatic or rural rabies, which is caused by various wildlife species functioning as reservoirs and/or transmitters, and urban rabies, which primarily affects domestic dogs.[61,62] In most Latin American countries, the prevalence of rabies spread by domestic animals has declined; however, rabies maintained and spread by wild animals, such as bats and terrestrial mammals, has lately returned to the continent.[63] According to our retrospective study this disease has endemic character in this province (83 cases confirmed) from 2011 to 2019 period. Furthermore, it is one to the greater periodically notifications by livestock farmers Table 2. Consequently, as it affects to all mammals (cattle, equines, pig fattening) should has high attention from local government, producers as well as researchers. Our study team has proposed a theory on these occurrences. Based on rainfall records, verified sanitary events, and animal populations, the following variables may be connected to their occurrence: 1) biological and 2) non-biological. The existence of sufficient refuge for vampire bats and their presence were biological considerations. Lord *et al.*[64], the availability of food sources, and the presence of rabies virus in this area. Orellana has high forest density, so allow suitable conditions to vectors of sylvatic rabies. Whereas, as nonbiological might be considered the type of productive systems and changing patterns in such activities, working and living conditions, access to rabies prophylaxis, and measures being implemented to control bat populations.[65] Therefore, biological factors are among the conditions necessary for maintaining the chain of transmission in the wildlife cycle of bat-transmitted rabies. In August 2014[34] declared Ecuador free country or zone where vaccination is not practiced. Therefore, the record

from 2012 has not notified Aphtose fever cases in this province when we have realized to retrospective study (2011 to 2019), Table 2. This free status opens us many trade opportunities with other countries. However, they have not been yet achieved high productivity levels. One factor may be the few associations between producers and clear politics.

On the other hand, 16 cases were related to vesicular stomatitis. Consequently, we ought to pay particular attention to its unique characteristics and endeavor to devise protocols to protect our freedom and enhance our competitiveness. Similarly, behaved was determined on Bluetongue virus (6 cases) is an orbivirus that is transmitted by a midge *(Culicoides variipennis)*.[49] It is the animal sickness caused by arthropods that is most important commercially. A fever, hyperemia, swelling of the nasal and buccal mucosa, excessive salivation, a swollen tongue, oral erosions, bleeding in the mouth's mucosal membranes, and bleeding in the mouth's coronary bands of the foot, which results in lameness, are among the clinical symptoms.[66] In tropical conditions such as Orellana province, there is a high presence of vectors (insects mainly) because of exuberant forest, and humid to the region that could predispose its appearance.

Other diseases were grouped as follows; Clostridial, Equine infectious anemia, Classical swine fever and Avian mycoplasmosis. The criteria for which researchers' team have decided to do it is primarily for their lower occurrence (Table 1 and 2). Anyway, despite their low occurrences, the minimum that we can suggest to producers is to establish good management practices, delimitation to the farms, and care for the sanitary status of their animals through deworming, vaccine plans and excellent clean and management of manure.

Apparent Prevalence Rates (P%)

Reliable and current data on disease prevalence is extremely required in order to track illness trends over time, make judgments about appropriate control measures and disease priorities, and monitor disease trends.[53] However, in this Province of Ecuador, lamentably have not been determined prevalence rates of no diseases of productive importance. As a result, their epidemiology is poorly understood and their prevalence is not sufficiently recorded. Because of the potential biases, the results of this experiment should be regarded cautiously. Anyway, all authors think that this research might be a starting point to get information (baseline) and propose studied more complex about the sanitary status to the livestock sector what allow us to suggest adequate control and prevention programs

The apparent prevalence rates were lower in all studied diseases (Accumulated prevalence rates; ranged from 0.02 to 1.55%) compared to other studies such as Maxwell *et al*.[48], Keramarou and Evans[67], Mondal and Yamage[68] and Carbonero *et al*.[69]. As most grouped diseases (zoonoses,

vesicular, and others) have low death, it should present high estimated prevalence rates except to acute rabies, causing a quick death and a brief illness period. Its frequency in the general population will therefore always be incredibly low.[36] Unfortunately, to seem has only been taken some samples randomly for surveillance passive or active from 2011 to 2019 period (data are shown in Table 2). Epidemiologically all events sanitary not have a pattern commonly observed in other work,[70] despite efforts for local or national zoosanitary authority to attend sanitary events reported by livestock farmers. There is a lack of clear politics to get ef-ficient and reliable surveillance and notification systems. According to Keramarou and Evans[67] and Gibbons *et al*.[71] the limitations could be associated with management and notification systems data. Furthermore, health services are typically less accessible in poor nations than in wealthy ones.[47,72]

This obtained research is fundamental for our productive conditions; near 5431 UPA's are mainly dedicated to livestock activities as subsistence farmers (on average, 56% data not published yet). Also, their inadequate communication services limiting their access.[67] Therefore, biological, physical, socio-economic, and political factors influence this province sanitary status between animals and producers.[46] As a result, the presence the animal diseases constitute the main risk of transmission to humans.

CONCLUSION

In this retrospective study, we have found through records from 2011 to 2019 in Orellana province that many diseases affect several animal species widely. Our concern is for those of a zoonotic and neurological nature. Their importance lies in the type of productive systems in which is development livestock activity. However, all animal diseases showed apparent prevalence rates not usually typical, according to other studies referenced. Therefore, these results must be interpreted with care. Anyway, it might be a starting point to propose one most comprehensive work to determine seroprevalence or know disease transmission dynamics in the livestock farmers in Orellana province. Likewise, when we have analyzed the different categories of the animal populations (cattle herd composition), Potential risk factors that should be taken into account for their role in the spread of disease have been identified. Our results therefore point to the realization that epidemiological studies are highly well-structured and have an appropriate size animal sample to ascertain the true rates of incidence and prevalence of these identified diseases. Lastly, to improve prevention and control initiatives and specify roles for public, private, and producer organizations, multidisciplinary teams comprising researchers, veterinarians, and public health professionals should be formed.

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