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Assessing the Presence, Seasonal Dynamicity and Effect of Toxic Plants on Ruminants in *Lare* and *Itang* Districts of Gambella Peoples Regional State Southwest Ethiopia

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Abstract: This study was conducted in "*Lare*" and "*Itang*" districts of Gambella People's regional state, South Western Ethiopia and assessed the presence, seasonal dynamicity and effect of toxic plants on large and small domestic ruminants. A cross sectional type of research was used to survey potential toxic plants for domestic animals from January 2016 to August 2016 with the help of a structured questionnaire format and plant sampling. A total of 255 individuals were interviewed (151 from "*Lare*" and 104 from "*Itang*"), of which 80.4% are males. Both infectious and non-infectious types of diseases challenge the livestock production system in the area (with 65.0%, 30.8%, combination of infectious and non-infectious and infectious diseases alone respectively), despite more than 60.4% said disease is the main livestock rearing obstacle in the areas. About 88.4% said cases of toxic plants mostly occur once per year while, very few of the participants said toxic plants as the problem, that occurs most often and often (8.2%, and 3.4% respectively). Shrubs are main source of plant toxicosis (97.3%). Of the total (146) participants, about 63.0% of them said, they attempt to treat locally/traditionally, while only 32.2% visits modern veterinary service. Among the top mentioned pre-disposing factors that expose animals for plant toxicosis in the study area were, food shortage (43.2%), accidental ingestion with feed (40.4%), nutritional deficiency (6.8%), and excess consumption (4.8%). The most common likely period of the year that plant toxicosis occur in general; beginning of wet season (48.6%), end of rainy season (32.9%), end of the dry season (12.3%) and peak of dry season (2.7%). Cattle, sheep and goats are among the susceptible and can cause various illness and also cause sudden death to them. Among the non-infectious diseases, plant poisonings are one of the non-infectious livestock health problems in the study areas, that resulting huge loss when animals graze in poisonous plant. Some of the identified toxic plants in the area includes Ngiar, Wath (Sorghum arundinaceum), Diir, Magak (Lactuca inermis Forssk), Nyuath and Zom (Ipomoea acquatica Forssk). Other toxic plants identified were Dep gany (Cissus quadrangularis L.), Tach Yaaz (Ipomoae acuatica Forssk) and Hygrophilla schulli (hamilt.) MR. & S. M Almeida species. Proper attention and further toxic plants epidemiological investigations should be conducted for minimizing the direct and indirect loss to the livestock sector in the region.

Keywords: Toxic Plant, Season, Risk Factors, Non-infectious, Shrubs

1. Introduction

1.1. Background

Many studies showed that toxic plants affecting both large and small animals are a major concern for the practicing veterinarian and livestock producer in every country of the world. In countries with higher plant biodiversity, the number of problematic toxic plants may be greater (Diaz, 2011), despite there are plants that played a central part in combating many aliments in human and livestock in many indigenous communities, in the world including Africa

(Bussmann *et al*., 2011)

Plants have played a central part in combating many ailments in human and livestock in many indigenous communities, including Africa. Ethiopia, which is located in the Horn of Africa between 3 to 15°N and 33 to 48°E longitude is a country with varied climatic conditions. The temperature varies from 10°C to 45°C (Tamire, 1997). This varied climatic condition enables the country to have diverse flora and fauna that are unique of which 12% are endemic. Despite the fact the forest is declining in size and quantity, the contributions to the national and local economy from forest resources are of immense value (WBISP, 2004).

Though plants do have advantages for human and animals as a food, medicinal values, some of the floras have also toxic effects in animals and humans (Clarke and Clarke, 1977).

Plants take the third largest category of poisons known around the world. The effect of this toxic plants on animals amplified as they form a major part of livestock feed, thus toxicosis in animals consuming these plants can be expected (Clarke and Clarke, 1977). Forage crops may sometimes contain compounds that may inadvertently affect animals. Several factors contribute to an animal being poisoned by plants. Fundamentally, there is the requirement that a sensitive species of animal ingest, or otherwise be exposed to, a toxic plant at an appropriate time. There are many examples of species differences with regard to sensitivity to the toxic effects of plants. In addition, it is possible for animal species to adapt to a potentially toxic plant if exposure is allowed to occur over a period of time. Disease problems are most commonly caused by forage contaminated with poisonous weeds.

Even though animals are selective about what they eat, there are instances (for example, herbicide applications) that may change palatability or increase toxicity of some plants. If weeds are embedded in hay cubes, animals may not be able to avoid ingestion of the weeds. Major economic constituted due to losses through the poisonous plants in economic loss in the livestock industry since the days of early settlement (Clarke and Clarke, 1977).

The loss may be in the form of, mortalities, production, veterinary service fees or a combination of two or more of these losses (Oguwag, 1977). The symptoms and lesions differ observed on the affected animals depending on the amount of theplant consumed, age, and species of the animals. Despite the variation in their effect the common clinical signs and symptoms, however include death, chronic illness and debilitation, decreased weight gain, abortion, abdominal discomfort, salivation, congenital defects, photosensitization (Clarke and Clarke, 1977). These symptoms have been attributed to the toxic principle in such plants, which range from nitrates, oxalate, fluroacetate, selenium etc. Both large and small animals are frequently affected by toxic plants and they are a major concern for the practicing veterinarian and livestock producer in every country. In countries with higher plant biodiversity, the number of problematic toxic plants may be greater. In a study conducted near Central Ethiopia by Abera *et al*. (2014) indicated that 68.8% of the respondents showed as the toxic plants are major livestock problems in the area.

The major challenging issue in case of plant toxicosis is the type of farming system farmers or livestock owners practicing. In countries like Ethiopia in general and Gambella Regional State in particular where livestock owners practicing extensive farming system present the chance of animals intoxicated with toxic plants high. All of the livestock in this region is kept under extensive system, making them susceptible for poisoning by toxic plants. With the current increasing human activities such as construction, farming, deforestation and other forms of environmental degradation, which affects the fauna and the flora, it becomes very important to assess common poisonous plants found in the region.

1.2. Statement of the Problem

In most parts of the world, in particular in Eastern Africa like the Ethiopia variety of poisonous plants have caused extensive losses to the livestock industry since early settlement times. These toxic plants are still results significant impact in many areas. These poisonous plants produce their toxic effects after being ingested and/or absorbed by animals (Radeleff, 1964) which include physical upset, loss of productivity and death. Having the fact that plants have vital nutritious and providing the normal atmospheric oxygen, it will cause also life threatening if it is toxic and poisonous (Bah, 2013).

The major problem of plant poisoning is due to the animals either accidental ingest of material eaten along with grass or willful consumption of poisonous plants when pasture is dry as most poisonous plants remain green all the year round while edible once dry away. Specially areas where diverse vegetation and animals graze beyond the close supervision of the attendants, feed shortage seasons, when animal's moves from one part of the country to another during feed shortage and trade (Mugera, 1987). Factors that expose animals for plant toxicosis are feed shortage which can force animals to browse perennial shrubs and bushes while most of these perennial plants have been known to contain toxic secondary metabolites (Seifert, 1969).

Various studies in different parts of the world showed as toxic plants do have various impacts on the animal health. Some of the impacts of the toxic plants includes, irritation and disorders of oral cavity and digestive system, causing haemolytic anemia, Methemoglobinemia(normal ferrous moiety (Fe^{2+}) oxidized to the abnormal ferric form (Fe^{3+})), causing coagulation of blood, cardio toxicity, hepatotoxicity, necrosis of the hepatic cells, causing Intrahepatic Cholestasis, affecting the urinary system, causing disorder in the nervous system (Block the Neuromuscular Junction, Affect the Central Nervous System (CNS), Cause Neurological Signs, Inducing Thiamine Deficiency), affecting the Musculoskeletal System and Connective Tissue, affecting the Skin, affect Reproduction, Containing Systemic Poisons, etc (Diaz, 2011). Areas like Gambella where there is diverse

plant species available, the risk of small and large animals being intoxicated will be high, where the result will contribute in reducing the problems of losing after toxic plants.

1.3. Research Questions

This research is expected to answer the following main questions:

a) Are there toxic plants in the study areas?
b) Which species of animals are affected severely by the toxic plants?
c) In which seasons of the year the toxic plants produce high impact?
d) What are the major impacts of toxic plants in the area?
e) Which botanic groups of plants dominantly found in the area?
f) Do the animal owners do have the awareness of toxic plants in the area?
g) What kinds of problem tackling are animal owners are practicing in the area?

1.4. Research Objective

This study was conducted with the following general and specific objectives.

General Objective

The general objective this study was

To assess the presence, seasonal dynamicity and effect of toxic plants on large and small domestic ruminants in *Lare* and *Itang* Districts of Gambella Regional State Southwest Ethiopia.

2. Materials and Methods

2.1. Research Location and Description of the Study Area

This study was conducted in two districts of the Gambella peoples' Regional States called *Lare* Woredas of Nuer Zone and Itange Special Woreda.

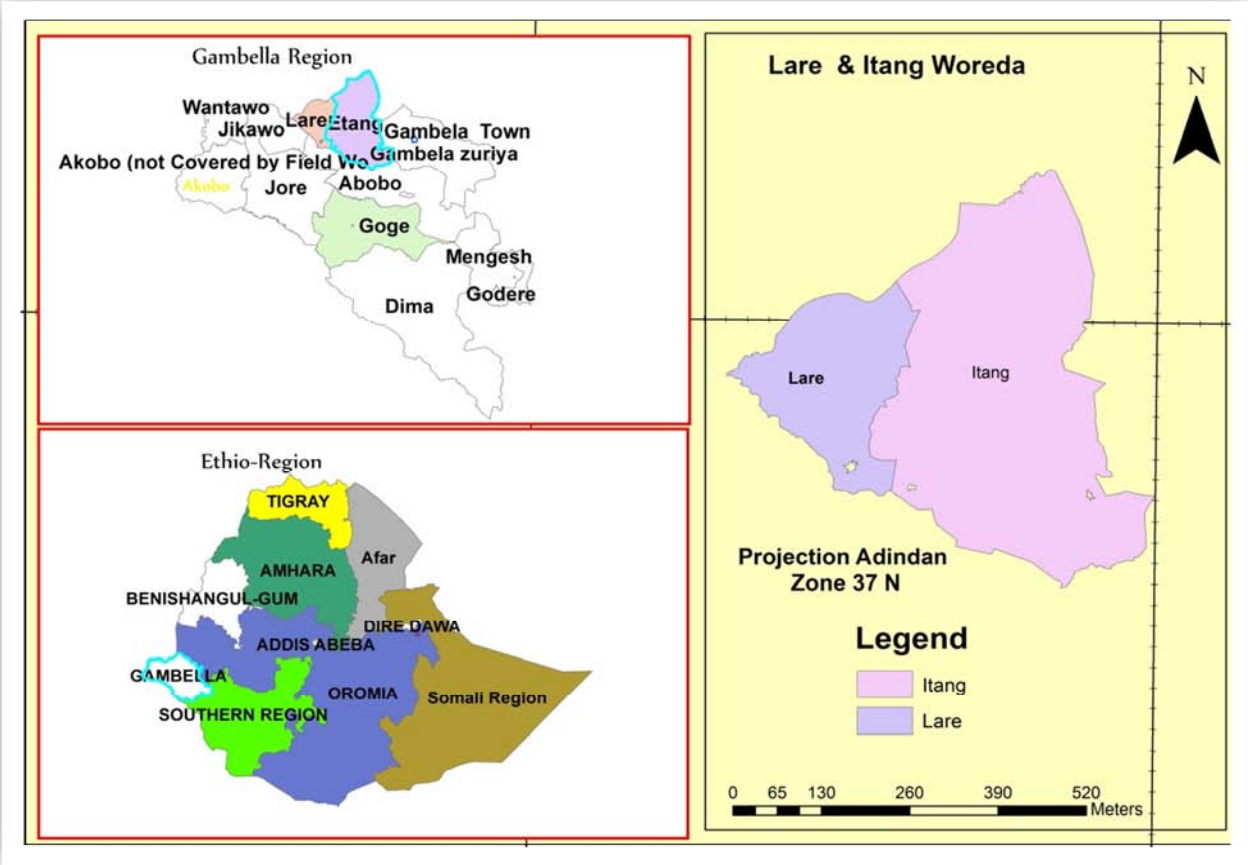

Figure 1. *Maps of the study areas.*

The region is located in the southwest part of Ethiopia, situated in the lowlands of the Baro-Akobo River Basin between latitudes $6^0$22' and $8^0$30' N, and longitudes $33^0$10' and $35^0$50' E, and covers a total area of about 34,063 square kilometers (GRS, 2003). The regional state is characterized as mild, lowland and semi-desert agro-ecological zones.

The annual rainfall and mean annual temperature in the

Regional State are 1,247 mm and 34.37°C, respectively (IAR, 1990). The rainfall regime is unimodal, referred to as the "*Sudan Type"*, occurs in the lowlands along the border with Sudan (Coppock, 1994). Poorly drained *vertisol* is the characteristic soil type of the grassland (GRS, 2003). The highest livestock population in Tropical Livestock Unit (TLU) is found in

Jikawo district 156,168.5 (53%), followed by Akobo, 114,390.8 (39.3%). The lowest TLU in Gog, which is, 1,341.6 (0.5%) (PADS, 2004). The major breed is the Nuer (zebu) which is a very good performer in dairying and beef production provided proper management levels (GRS, 2003) and considered to have a high tolerance to tsetse challenges (Alemayehu, 2004).

Lare Woreda is also located in Nuer zone of the Gambella region, *Lare* is one of the woreda as in the Gambella Region of Ethiopia. Part of the Nuer Zone, *Lare* is bordered on the south and east by the Anuak Zone, on the west by the Baro River which separates it from Jikawo, and on the north by the Jikawo River which separates it from South Sudan. Towns in *Lare* include Kowerneng (GBOA, 2007).

The small and large domestic ruminants population size of the region based on the CSA (2012) report the cattle population of the Gambella Region as 251,367, out of this about 183,363 of them is found in Nuer zone whereby this research was conducted and 33,582 cattle in *Itang* special *woreda*. While the small ruminant populations were also found in these study sites. From the total small ruminants 130,225 sheep and goats 96,717 are found in Nuer zone, and 17, 093 in *Itang* special Woreda, while the rest large and small ruminants located in *Mezenge* and *Agnuwa* zones.

Livestock Production System of the Area

The production system of the region is mainly livestock rearing and seldom crop production. Almost all the animals reared by smallholder farmers in extensive system. The livestock populations owned by the farmers are large in number.

2.2. Research Type

Cross sectional type of research was used to survey potential toxic plans for domestic farm animals from January 2016 to August 2016 in the selected districts of Gambella Regional State.

2.3. Study Design

A structured questionnaire was prepared to survey the potential toxic plants in the two districts *Lare* and *Itang* special woreda for the animal owners. Besides the samples of toxic plants were collected and taken to Addis Ababa University, faculty of science for botanical grouping.

2.4. Data Sources

This research generated primary data from farmers, animal health practitioners, key respondents and plant samples in the field.

2.5. Data Collection Instruments

The data collection methods were structured questionnaire, prepared checklists, pencils &pens, papers, digital camera, CD/Flash, bags, markers, etc.

2.6. Sampling Frame/Population

The target study populations were voluntary animal owners.

2.7. Sampling Technique

Purposefully we selected three kebeles from each woreda/district based on the livestock rearing practice. From each kebele we took, voluntary respondents both from the animal owners and from animal health practitioners.

2.8. Sample Size

Based on the Abera *et al*. (2014) in a study conducted in the East Showa Adama area, Ethiopia, the current sample was 255 voluntary animal owners employed.

The sample size estimated to be 255 using the following formula (Thrustfield, 2007),

$$N = \frac{Z^2 \frac{\propto}{2} P(1-P)}{d^2} = \frac{1.96^2 * 0.8\ (1-0.8)}{0.05^2} = 255$$

Where N=number of respondents of the animal owners

P= Proportion of people who were respond to the household questionnaire about the toxic plants for small and large ruminants in the two study districts.

Z= 1.96 at 95% confidence interval

d= expected margin of errors, i.e. 0.05

N= required sample size

The total sample size is 255.

2.9. Methods of Data Analysis

The information that was gathered through questionnaire survey of suspected toxic plants entered into the Microsoft Excel program. To identify the scientific names of the complainants poisonous plants the National Herbarium of Biology, Department of Science Faculty, Addis Ababa University was consulted. The data was analyzed by descriptive statistics using SPSS version 16.0.

Data Quality Control

During data collection in the field and at the end of each day, the questionnaires reviewed and checked for completeness, accuracy and consistency by the investigators and corrective measures were taken.

Plant samples information for identification of their botanical group were taken curiously, such as ecological preferences, local names, village, kebele…etc.

2.10. Working Permission

Working permission was obtained from the respective woreda administration office by holding a letter of support from the Gambella University Research and Community service Directorate office.

2.11. Descriptive Variables

Table 1. *List of Descriptive Variables.*

Dependentvariable	Independentvariables
Toxicplant'spresence	Speciesoftheanimal
Riskfactor	Age
Knowledge, Attitude of the practices of the society	Sex
Impactofthetoxicplants	Season
Parts of the plant	Partsoftheplant (leaf, root, fruit.)
Habitat of the plant	Educationallevel
	Experience
	Dosage
	Speciesoftheanimal
	Seasonoftheyear
	Location

The independent variables of this study were the socio-economic characteristics of the population, species of the animal, season of the year, location etc while the types of toxic plant, dependent variables, parts, knowledge and attitude practice of the society etc.

3. Results

3.1. Socio-demographic Characteristics of the Study Participants

A total of 255 individuals were interviewed (151 from *Lare*, and 104 from *Itang*), of which 80.4% are males. (Figure 1).

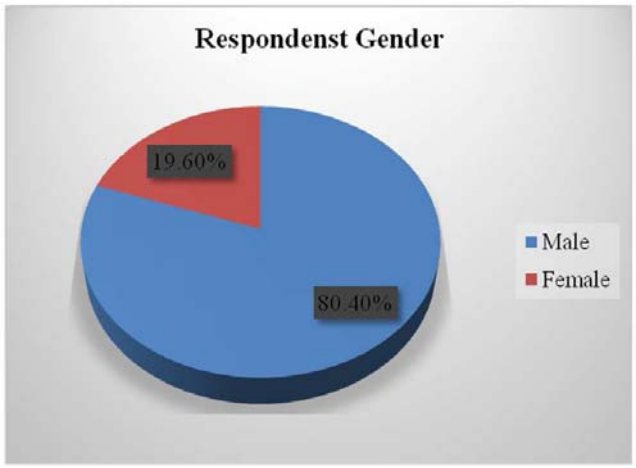

Figure 1. *Respondents Gender in the two districts of Lare and Itang Special Woreda.*

Almost 94.5% (241) are married with low percentages of unmarried and divorced, 1.2%, and 2.4% respectively, using structured questionnaires. The proportions of respondents were 3 kebeles from each woreda. About 88.8% of the respondents' are engaged farming activity while only 6.3% are civil servants in the woredas among the study participants (Table 1).

Table 2. *Socio demographic characteristics of the respondents.*

Characteristics	Frequency (N)	Percent (%)	Characteristics	Frequency (N)	Percent (%)
Sex of the respondents			Educational Status		
Male	205	80.4	Not writing and reading	151	59.2
Female	50	19.6	Writing & reading (informal)	16	6.3
Marital status			1-4 grade	23	9.0
Married	241	94.5	5-7 grade	24	9.4
Unmarried(never)	3	1.2	8-12 grade	29	11.4
Divorced	6	2.4	certificate and above	12	4.7
Other	5	2.0			
Occupation status of the respondents'			Kebele of the respondents		
Farmer	226	88.6	Kutogni (*lare*)	50	19.6
Civil servant	16	6.3	Bilimkun (*lare*)	50	19.6
Merchant	10	3.9	Reak (*lare*)	51	20.0
Other	3	1.2	Pilual (*itang*)	34	13.3
			Pulkot (*Itang*)	37	14.5
			Itangkir (*Itang*)	33	12.9
How many years you lived in the area					
Less than 5 years	51	20.0			
More than five years	204	80.0			

3.2. Farming Activity in the Area

Study participants mainly engaged in both livestock and crop production mainly compared to livestock farming, 24.7% and 75.3% respectively in the study areas. Almost many of the study participants own cattle in the livestock structure and very few only have sheep and goats alone. The main feed source of livestock in the study areas are shrubs types of plants compared to the tree sources (84.7%) as shown in Table 2.

Table 3. *Farming activities, Livestock owned, and type of feed animals consume.*

Variable	Frequency (N)	Percent (%)
what is your current farming activity		
Livestock only	63	24.7
Both livestock & crop	192	75.3
Which species of domestic animals do you own?		
Cattle	64	25.1
Sheep	4	1.6
Goats	7	2.7
cattle, sheep, goats, poultry	63	24.7
cattle & sheep	10	3.9
cattle, goats	30	11.8
cattle, sheep, goats	23	9.0
Cattle, goats & poultry	33	12.9
Cattle& poultry	9	3.5
Sheep & poultry	1	.4
Goats & poultry	1	.4
Cattle, Sheep 7 poultry	10	3.9
where your livestock most of the time grazes in the area		
Shrubs	216	84.7
Tree	2	.8
Shrubs and Tree	37	14.5

3.3. Livestock Rearing Constraints

Table 3 below illustrates the major livestock rearing problems. About 60.4% of the participants indicated presence of diseases is the primary challenging followed by absence of animal feed (5.9%). The remaining challenges are the combinations of different factors. Both infectious and non-infectious types of disease challenges the livestock production system in the area (with 65.0%, 30.8%, combination of infectious and non-infectious, infectious diseases alone respectively) (Table 3).

Table 4. *Major livestock rearing constraints in the study areas.*

Variable	Frequency (N)	Percent (%)
what are the major ruminants rearing problems in the area(N=255)		
Presence of diseases	154	60.4
Absence of animal feed	15	5.9
Disease and animal feed	18	7.1
Disease and water	9	3.5
Disease, water, and animal feed	59	23.1
if your response is presence of diseases for question number what kind of diseases (N=240)		
Infectious types of diseases	74	30.8
Non-infectious types of diseases	10	4.2
Infectious and non-infectious	156	65.0

3.4. Toxic Plants in the Study Areas

About 13.9% of the participants mentioned toxic plants are among the non-infectious diseases, while others mentioned toxic plants as combination of toxic plants and other factors. Nutritional disorders (6.0%) and congenital problems (3.0%) are among the other non-infectious diseases mentioned by the participants. Among the 146, who mentioned toxic plants as a livestock health problem alone or in combinations with other factors, most of (88.9%) said the problem occurs once in a year. Very few of the participants said toxic plants as the problem, that occurs most often and often (8.2%, and 3.4% respectively). Shrubs are main source of plant toxicosis (97.3%) (Table 4).

Table 5. *The contribution, seasonal frequency, common plant groups in the study area.*

If non-infectious (N=166)	Frequency (N)	Percentages (%)
Nutritional disorder	10	6.0
Congenital problems	5	3.0
Toxic plants	23	13.9
Nutrition & congenital problems	5	3.0
Nutritional and toxic plant	34	20.5
Non-genital and toxic	28	16.9
All the three	61	36.7
Frequency of toxic plant occurrences (N=146)		
Three time per year(most often)	12	8.2
Two times per year(Often)	5	3.4
One time per year (Seldom)	129	88.4
Common plant groups sources of toxicosis for livestock (N=146)		
Shrubs	142	97.3
Trees	1	0.6
Both shrubs and trees	3	2.1

3.5. Common Remedial Measures Taken by the Participants in the Area

Of the total (146) participants, about 63.0% of them said, they attempt to treat locally/traditionally, while only 32.2% visits modern veterinary service (Table 5).

Table 6. *Common remedial measures for plant toxicosis and other diseases in the study area.*

Measures after animals get plant toxicosis (N=146)	Frequency (n)	Percentage(%)
Treat by local/traditional medicines	92	63.0
Visit animal health professionals	47	32.2
Leave to cure by itself	5	3.4
Both traditional and veterinary clinics	2	1.4

Equally with the toxic plants, participants try to tackle other infectious and non-infectious diseases locally/traditionally (63.9%) and through modern veterinary treatment (32.2%) (Figure 2).

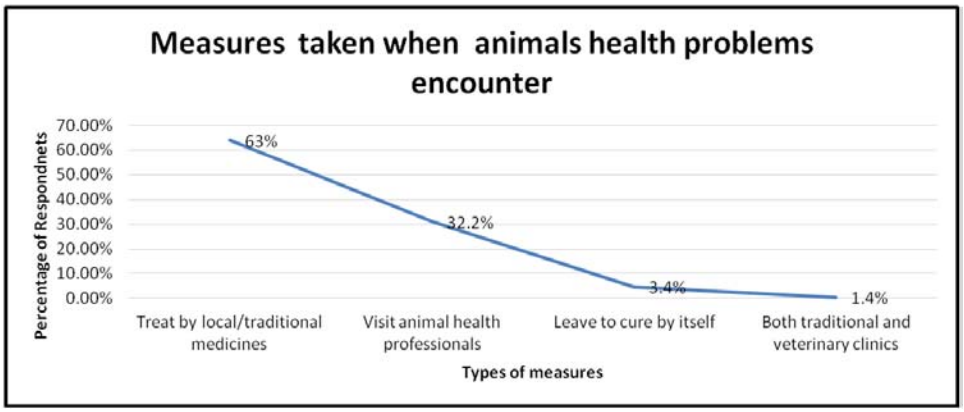

Figure 2. *Measures taken by respondents when other than toxic plants health problems encounter.*

3.6. Risk Factors, Occurrence Season, for Plant Toxicosis in the Area

Among the top mentioned pre-disposing factors that expose animals for plant toxicosis in the study area were, food shortage (43.2%), accidental ingestion with feed (40.4%), nutritional deficiency (6.8%), and excess consumption (4.8%). The most common likely period of the year that plant toxicosis occur in general**;** beginning of wet season (48.6%), end of rainy season (32.9%), end of the dry season (12.3%) and peak of dry season (2.7%). Regarding the high availability of toxic plant; participants mentioned wet season (97.3%) is highly preferred for the occurrence of toxic plants (Table 6).

Table 7. *Pre-disposing factors, seasonal preferences and occurrence of toxic plants in the study areas.*

Variable	Frequency (N)	Percent (%)
The pre-disposing factors for the exposure of animals for plant toxicosis (N=146)		
Food shortage	63	43.2
Nutritional deficiency	10	6.8
Excess consumption	7	4.8
Accidental ingestion with feed	59	40.4
Unknown reason	1	0.7
Food shortage & Accidental ingestion with feed	1	0.7
Nutritional & accidental ingestion with feed	1	.7
Food shortage, nutritional deficiency, and accidental ingestion with feed	4	2.7
Common period of the year plant toxicosis most likely occur in general (N=146)		
Beginning of wet season	71	48.6
End of rainy season	48	32.9
Peak of the wet season	1	.6
Beginning of dry season	2	1.4
End of the dry season	18	12.3
Peak of dry season	4	2.7
Beginning of wet season, end of rainy season	2	1.4
Availability season of the toxic plant (N=146)		
wet season	142	97.3
dry season	3	2.1
all year round	1	.6

3.7. Species Affected and Common Areas Where Toxic Plants Located

Livestock species affected due to toxic plants according to the participants include cattle (28.1%), goats (1.4%), sheep (0.7%), and combination of cattle, sheep & goats. Toxic plants are located in the riverbank (watering point) (43.8%), rangeland (23.3%), backyard (15.8%), and farmland (14.4%) (Table 7).

Table 8. *Frequently affected domestic animals and common locations of the toxic plants in the study area.*

Species Affected (N=146)	Frequency	Percentage
Cattle	41	28.1
Goats	2	1.4
Sheep	1	.6
cattle, sheep, goat	75	51.4
cattle & goats	13	8.9
goats and sheep	14	9.6
common location of the toxic plant (N=146)		
Range land	34	23.3
Farm land	21	14.4
River bank/water point	64	43.8
Back yard	23	15.8
Farm land & river bank/water point	4	2.7

3.8. Toxic Body Part, Exposures, and Impacts of Toxic Plants for Animals

The toxic body parts of plants in this study based on the participants' response include from top to low proportions; leaves (50.7%), whole plant (31.5%), leaves and stem (16.4%) and juice (1.4%) (Figure 3). A single exposure to toxic plant can affect the animal according to 68.5% participants' response, while 31.5% said there should be a repeated exposure for abnormal changes on the animals (Figure 4).

The impact of toxic plants extends from simple signs (30.1%), organ impairment (24.7%), production decrement (24.7%) and death (20.5%) (Figure 5).

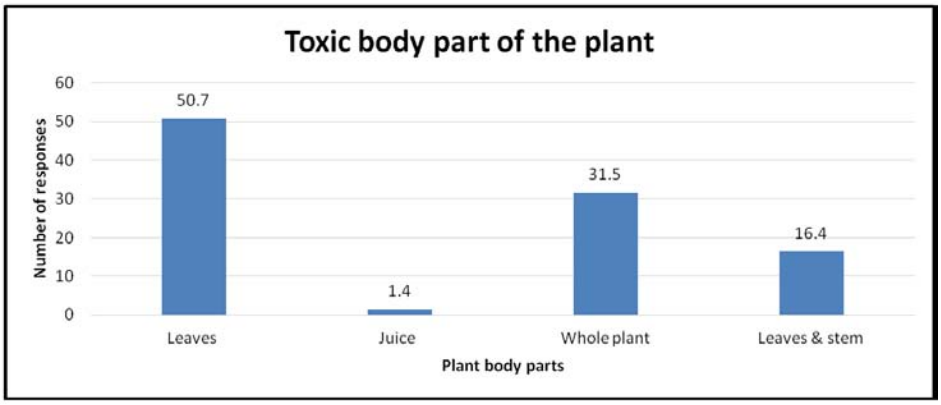

Figure 3. *Toxic plant body parts according to the response of study participants in Lare and Itang.*

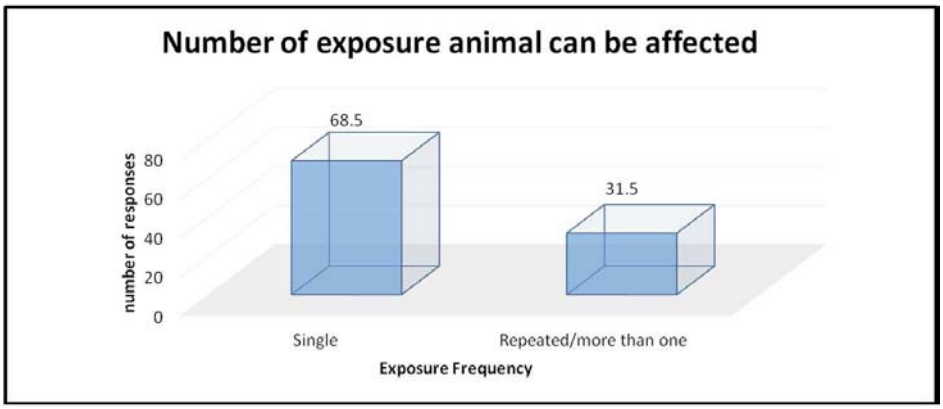

Figure 4. *Number of exposures that can affect an animal according to the response of study participants.*

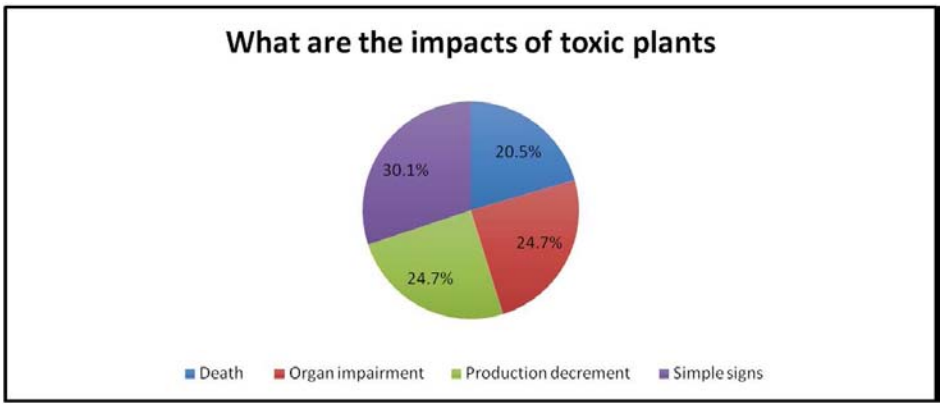

Figure 5. *Impacts of toxic plants on the animal according to the response of study participants.*

3.9. Qualitative Approach of Experts Opinion About Plant Toxicosis

There were two experts at animal health assistant level, one for each district who were active at the job and responded for this study. Qualitatively explaining, the experts mentioned the presence of toxic plants in the area. This toxic plants available both during dry and wet season. The livestock species commonly affected by these plants based on the experts opinion includes cattle, sheep and goats, with the age groups ranging from one two three years, despite the impact extends from young to adults. Animals affected with the toxic plants showed sudden death, various sickness and production impairments despite the fact the sudden death is most frequent occurrence. Cases of toxic plants are more frequently occur at the beginning and end of dry season, peak of dry season in the study areas based on the experts' opinion. The common sources of plant toxicosis according to the responses of experts were both wild and domestic plants despite the wild contributes the vast majority of the proportions. Among the plant groups, the shrubs are among the top mentioned that become sources of plant toxicosis. The pre-disposing factors in the study areas based on the experts' opinion for plant toxicosis were accidental ingestion

with feed, animal feed shortages and excess consumptions.

4. Discussion

The farming activity in the current study areas was dominated by mixed farming system of both livestock and crop production (75.3%) of the participants agreed. Among the livestock farming system, cattle rearing are widely practiced, despite goats, sheep and poultry also reared in the area. Animals graze more in shrub (84.7%) than plants tree species.

Among the major problems in these study areas were animal health challenges including diseases (60.4%), scarcity of animal feed (5.9%) and water shortage. Besides these independent problems, in vast majority of the study participants, combinations of different constraints such as diseases (infectious and non-infectious), scarcity of animal feed (5.9%) and water shortage (60.4%) is playing a great impact on the animals production and productivity in the areas. The problems of both infectious and non-infectious diseases on livestock in the study areas are high according to the study participants (65.0%) response.

This research result showed as non-infectious problems such as toxic plants among the toxicosis of livestock. In this study, non-infectious diseases caused by toxic plants are the health challenges of livestock mentioned by 13.9% of the participants alone. Toxic plants in combination with other factors such as congenital and nutritional deficiency took 74.1% of the problem share. Independently looking, nutritional disorders (6.0%) and congenital problems (3.0%) are among the other non-infectious diseases mentioned by the participants (Abera *et al*., 2015; Abera *et al*., 2014; Kebede *et al*. (2015). The result was also similar with other studies conducted outside from Ethiopia, (Adediwura and Kola, 2012) in Nigeria; (Torres *et al*., 2012) in Colombia; (Durairaj, 2012) in Tiruchrapalli districts of Tamil Nadu, South India. The current study indicated the impacts of toxic plants with other non-infectious and infectious diseases in the South West Ethiopia. Similar findings were also seen in various locations of Ethiopia and other parts of the world. Some of the studies with similar findings in Ethiopia.

The most common likely period of the year plant toxicosis occur in general in this study were: beginning of wet season (48.6%), end of rainy season (32.9%), end of the dry season(12.3%) and peak of dry season(2.7%). Based on the present study result, which is similar with Abera *et al*. (2015) in the seasonal occurrence of toxic plants, most of them occur during the end of rainy season. Regarding the availability of toxic plant, 97.3% of the participants mentioned wet season is highly preferred for the occurrence of toxic plants. Other study showed animals usually poisoned at the start and end of rainy season and during the dry season (Abera *et al*., 2015). This may be due to the area is known to have long rainy season, most of the plant species grow within this period of time and the chance that animals to pick this plant species with other regular feed might be high. Towards the frequency of toxic plants occurrences, 88.4% said they once per year, which is seldom in availability, even though, there are few responses where they may occur more than one per year in the study areas. The occurrence of toxic plants in this region become per year might relate to the uni-modal rainy season that boost the growth of these plants only during the rain shower.

The common periods of the year where plant toxicosis is seen in this study: at the beginning of the wet season (48.6%), end of rainy season (32.9%) and end of the dry season (12.3%). This study indicated the existence of high non-infectious health problems such as toxic plants in the area that needs interventions and further toxicology study to reduce livestock exposure and further research to determine the toxicogenic ingredients of the plants.

Shrubs are main source of plant toxicosis(97.3%) in the study area. It is suggested that, the impact of shrubs as a source of toxicosis compared to trees may be due to the easy availability and access for animals compared to trees, which are not easily accessed. Similarly, a study by Agaie *et al*. (2007), reported a high proportion of shrubs contribute (84.2%) for plant toxicity while only 15.8% said trees are source of toxicity, although the status of plants was not ascertained here.

For most of the plant toxicosis cases, study participants provide for affected animals the traditional treatments (63.0%), than modern veterinary service (32.2%). Despite the fact, the proportion of local/traditional treatment is higher; significant number of individuals takes their animals for modern treatment service. Among the top mentioned predisposing factors that expose animals for plant toxicosis in the study area were, food shortage (43.2%), accidental ingestion with feed (40.4%), nutritional deficiency (6.8%), and excess consumption (4.8%) which is similar with the predisposing factors obtained according to Kebede *et al*. (2015) on a study conducted in East Wollega Zone of Oromia Regional State, Western Ethiopia. Other reports from other parts of the world indicated feed, nutritional deficiency, water shortages and others factors like sudden graze aggravate the chance of ingesting toxic plants and poisoned water (Seifert, 1969; Radostits *et al*., 2007; Adediwura and Kola, 2012; Torres *et al.,* 2012; Abera *et al*., 2014).

In this survey study, 12 common major toxic plants to livestock were identified and documented by their local name. Some of the toxic plants primarily mentioned by the study participants were: *Ngiar*(32.9%), *Wath*(28.1%), *Diir* (8.2%), *Magak* (5.5%), *Nyuath* (4.1%) and *Zom* (4.1%) were the most frequently complained toxic plants in the study areas, which affect cattle, sheep and goats, and cattle & goats respectively. The toxic plant locally called *Ngiar* is found widely distributed in range land, farmland, river bank, and backyard areas.

In the present study, the common locations where toxic plants are located in the riverbank (watering point) (43.8%), rangeland (23.3%), backyard (15.8%), and farmland (14.4%). On the other hand, Agaie *et al*. (2007) indicated about 95.4% study participants replied toxic plants are located around farm/range lands particularly. The other types of toxic plants

are exclusively found around river banks and water points. Abera *et al. (*2014) also mentioned most of the toxic plants are located near the farmland together with forage plants.

The most common parts of the plant that causes toxicosis based on the study participants were whole plants and leaves that are similar with Abera *et al.* (2015), a research conducted in Western Ethiopia. A study in Nigeria stated leaves and barks are highly toxic plant parts among the total body parts (Agaie *et al*., 2007). Single exposure for toxic plants (68.5%) may lead to the abnormal conditions of bloating, circling, death, sudden death; raised hair coats, colic and other signs, despite few may show after second exposure, where Abera *et al*. (2015) also indicated. This probably indicates the high toxicity capacity of the plants to bring abnormal changes within a single exposure or the dose the animals took during the first ingestion. The impacts vairedfrom simple signs to sudden death.

5. Conclusions

The current study showed infectious and non-infectious livestock health problems are among the major constraints for rearing in the areas. Among the non-infectious diseases, plant poisonings are one of the non-infectious livestock health problems in the study areas, that resulting huge loss when animals graze in poisonous plant infested areas of "*Lare woreda"* and "*Itang"* special "*woredas*" of Gambella regional state. This study tried to identify 12 common major toxic plants to livestock were identified and documented by their local name. The common toxic plant groups identified in this study were shrubs followed by tree species. Some of the toxic plants primarily mentioned by the study participants were: *Ngiar*, *Wath (Sorghum arundinaceum)*, *Diir*, *Magak (Lactuca inermis Forssk)*, *Nyuath* and *Zom (Ipomoea acquatica Forssk)*. Other toxic plants identified were *Dep gany(Cissus quadrangularis L.*), *Tach Yaaz (Ipomoae acuatica Forssk*) and *Hygrophilla schulli (hamilt.) MR. & S. M Almeida species.* The toxic plants were reported in riverbanks (watering point), rangeland, backyard, and farmland areas. Consumption of whole plants and leaves are among the potent toxic parts based on the responses of the findings. Most of the livestock owners tackle plant poisoning through traditional treatment despite there are significant number of owners who are practicing traditional/local treatment for toxic plant affected livestock. Some of the risk factors for plant toxicosis obtained in this study were food shortage, accidental ingestion with feed, nutritional deficiency, and excess consumption.

Based on the present research findings it is recommended to forward the following points

a) There need to be a detailed investigation to know the epidemiology of the poisonings caused by plants
b) Livestock owners should be advised to remove the toxic plants from the watering points, rangeland, backyard and farmland
c) Further toxic plant studies with the analyzing the type of toxin and measuring the toxicity level should be studied.
d) Necessary measures and methods should be taken to tackle the impacts of toxic plants.
e) A systematic integration with appropriate stakeholders should be made to reduce and avoid the impacts of the common toxic plants in the area
f) It is advised to limit or avoid the pre-disposing factor of livestock for plant toxicosis
g) Proper attention towards the toxic plants impacts prevention and control should be given in the areas

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