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Documentation of Toxic Plants Affecting Livestock In Khanapara, Kamrup, Assam: A Cross-Sectional Field Study

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Background: Plant poisoning is an under-reported but economically significant health problem affecting smallholder livestock in peri-urban areas of Northeast India. Khanapara, a major livestock trade hub in Kamrup district, Assam, has no published inventory of toxic flora despite frequent reports of unexplained livestock illness and death.

Methods: A cross-sectional survey was conducted from October 2024 to March 2025 in four villages in and around Khanapara. Livestock farmers were interviewed using a semi-structured questionnaire, and a comprehensive field inventory of suspected toxic plants was prepared with herbarium specimen collection. Plant identification and toxicity profiling were performed using standard references.

Results: Thirty plant species belonging to 18 families were documented. The most frequently reported toxic plants were *Parthenium hysterophorus* (98.8% of farmers), *Lantana camara* (91.7%), *Ricinus communis* (81.2%), *Datura stramonium* (78.8%), *Abrus precatorius* (76.5%), *Jatropha curcas* (71.8%), *Gloriosa superba* (61.2%) and *Ageratum conyzoides* (58.8%). The highest mortality reports were associated with *P. hysterophorus* (63.5% of farmers reporting deaths) and *R. communis* (48.2%). The estimated annual economic loss due to plant poisoning ranged from ₹12,000 to ₹35,000 per affected household (approximately US$140–410).

Conclusion: Plant poisoning is a serious but neglected constraint to livestock farming in Khanapara. Comprehensive awareness programs, pasture management strategies, and accessible veterinary support are urgently required.

Keywords: Toxic plants, livestock poisoning, Khanapara, Assam, Parthenium, Lantana, ethnobotany, smallholder farmers

1. Introduction

Plant poisoning represents a significant yet frequently under-documented health challenge for livestock in tropical and subtropical regions. In India, the issue is particularly prevalent in rural and peri-urban areas where livestock are often exposed to a diverse flora that includes numerous toxic species. The situation is exacerbated by seasonal fodder scarcity—documented in Khanapara earlier—which forces animals to graze on weeds and non-conventional forages, increasing their

risk of poisoning. Globally, several hundred plant species are known to be toxic to domestic animals, with clinical consequences ranging from mild gastrointestinal disturbances to acute multi-organ failure and sudden death.

Khanapara is a peri-urban locality on the southern fringe of Guwahati city, Kamrup district, Assam. It hosts one of Northeast India‘s largest livestock markets, with thousands of cattle, goats, buffaloes and poultry changing hands annually. The area is characterized by a mix of fragmented grazing lands, waste grounds, road verges, fallow fields and cultivated plots. Rapid urbanization has progressively reduced available pasture area, and farmers increasingly report that their animals inadvertently consume toxic weeds growing on degraded lands [Personal communication with local veterinary officer, 2024].

Despite anecdotal claims of livestock poisoning and death following ingestion of wild plants, no systematic inventory of Khanapara’s toxic flora exists. The objectives of this study were: (1) to document the diversity of plants perceived by local farmers to be toxic to livestock; (2) to identify the plants most frequently associated with illness and mortality; and (3) to estimate the economic burden of plant poisoning on smallholder households.

2. Materials and Methods

2.1 Study Area and Sampling

The study was conducted in four villages around Khanapara: Bonda, Nizarapar, Kachari Gaon and Hatigaon fringe. A total of 85 livestock-keeping households were purposively selected, comprising 48 cattle owners, 25 goat owners and 12 mixed-species owners. All respondents had reared livestock for at least five years and could recall specific poisoning incidents within the preceding 24 months.

2.2 Field Survey and Plant Collection

A semi-structured questionnaire was administered to each household. Information gathered included: types of plants believed to be toxic, observed clinical signs in poisoned animals, seasonality of poisoning incidents, number of animals affected and deaths in the past two years, estimated treatment costs and livestock value lost.

Concurrently, a field inventory of suspected toxic plants was conducted across the study villages. Representative plant specimens were collected, pressed and identified using standard floras. Final confirmation of botanical names was performed using the “Poisonous Plants of India” database (ICAR) and experts’ consultation.

2.3 Toxicity Classification

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Each documented plant was classified according to: major toxic principle(s), toxic plant part(s), susceptible livestock species and typical clinical syndrome observed (gastrointestinal, neurological, hepatotoxic, photosensitization, cardiotoxic). Severity was categorized as:

· **High:** Frequently associated with rapid death (within 24–72 hours)

· **Moderate:** Causes severe illness but death less common if treated and

· **Low:** Causes mild, self-limiting symptoms.

2.4 Economic Loss Estimation

Direct losses were estimated by summing: (a) value of reported animal deaths (based on local market prices of ₹40,000–60,000 per adult cattle, ₹3,000–5,000 per goat), (b) veterinary treatment costs (medicines, transport, consultation fees), and (c) productivity losses (reduced milk yield for 2–4 weeks post-illness). Indirect losses (labour time, breeding disruption) were not quantified.

3. Results

3.1 Diversity of Toxic Plants

A total of 30 plant species belonging to 18 botanical families were documented as toxic or potentially toxic to livestock in Khanapara. The families with the highest number of toxic species were Fabaceae (four species), Apocynaceae (four species) and Solanaceae (four species).

List I: Toxic plants documented in Khanapara (n=30)

1. Local name: Congress ghas / Gajar ghas
English name: Carrot grass / Congress grass
Scientific name: *Parthenium hysterophorus*
Family: Asteraceae
Toxic part(s): All parts
Toxin(s): Parthenin (sesquiterpene lactone)
Primary Clinical Effects: Dermatitis, contact allergy, anorexia, bitter milk, liver damage, death.

2. Local name: Gurkamal / Ghaneri
English name: Lantana
Scientific name: *Lantana camara*
Family: Verbenaceae
Toxic part(s): Green leaves, green berries
Toxin(s): Lantadenes A-D (triterpenoids)
Primary Clinical Effects: Hepatotoxicity, intrahepatic cholestasis, secondary photosensitization.

3. Local name: Erandi
English name: Castor bean
Scientific name: *Ricinus communis*
Family: Euphorbiaceae
Toxic part(s): Seeds (whole or crushed)
Toxin(s): Ricin (toxalbumin)

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Primary Clinical Effects: Severe gastroenteritis, haemorrhagic enteritis, convulsions, death.

4. Local name: Dhatura
English name: Jimsonweed / Thorn apple
Scientific name: *Datura stramonium*
Family: Solanaceae
Toxic part(s): All parts (especially seeds)
Toxin(s): Atropine, hyoscyamine, scopolamine (tropane alkaloids)
Primary Clinical Effects: Anticholinergic syndrome: mydriasis, tachycardia, dry mucous membranes, delirium, hyperthermia.

5. (A) Local name: Rati / Gunja
English name: Rosary pea / Crab's eye
Scientific name: *Abrus precatorius*
Family: Fabaceae
Toxic part(s): Seeds (especially crushed)
Toxin(s): Abrin (toxalbumin)
Primary Clinical Effects: Necrotic lesions at ingestion site, gastroenteritis, multi-organ failure.

5. (B) Local name: Kuberakshi / Ghetu
English name: Crab's eye (white-seeded variant)
Scientific name: *Abrus precatorius* (white-seeded variant)
Family: Fabaceae
Toxic part(s): Seeds
Toxin(s): Abrin
Primary Clinical Effects: Similar to red-seeded variant; slightly lower acute toxicity but still dangerous.

6. Local name: Ghritakumari
English name: Aloe vera
Scientific name: *Aloe vera (syn. Aloe barbadensis)*
Family: Asphodelaceae
Toxic part(s): Leaf pulp, especially yellow sap
Toxin(s): Anthraquinones (aloin, barbaloin)
Primary Clinical Effects: Cathartic effect, diarrhoea, dehydration, abdominal pain (mild to moderate).

7. Local name: Jhunjhunia / Ban tulsi
English name: Wild basil / Billygoat weed
Scientific name: *Ageratum conyzoides*
Family: Asteraceae
Toxic part(s): All parts
Toxin(s): Pyrrolizidine alkaloids (PA)
Primary Clinical Effects: Chronic hepatotoxicity, photosensitization, veno-occlusive disease.

8. Local name: Pohul / Karwi
English name: St. John's wort
Scientific name: *Hypericum perforatum*
Family: Hypericaceae
Toxic part(s): Aerial parts, flowers

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Toxin(s): Hypericin, pseudohypericin
Primary Clinical Effects: Primary photosensitization (unpigmented skin) after sun exposure.

9. Local name: Bah / Jati bah
English name: Bamboo
Scientific name: *Bambusa spp.*
Family: Poaceae
Toxic part(s): Young shoots (raw)
Toxin(s): Cyanogenic glycosides (taxiphyllin)
Primary Clinical Effects: Cyanide poisoning: dyspnoea, bright red blood, convulsions, sudden death.

10. Local name: Laajuk / Lajwanti
English name: Touch-me-not / Sensitive plant
Scientific name: *Mimosa pudica*
Family: Fabaceae
Toxic part(s): Whole plant, especially pods
Toxin(s): Mimosine
Primary Clinical Effects: Alopecia, growth retardation, goitre, reproductive failure (chronic, mainly non-ruminants).

11. Local name: Bhotera / Bagh bherenda
English name: Purging nut / Barbados nut
Scientific name: *Jatropha curcas*
Family: Euphorbiaceae
Toxic part(s): Seeds, seed oil, latex
Toxin(s): Curcin (phytotoxin), phorbol esters
Primary Clinical Effects: Violent purgation, bloody diarrhoea, dehydration, circulatory collapse.

12. Local name: Bheemal / Amaltas / Sonaru
English name: Golden shower tree / Purging cassia
Scientific name: *Cassia fistula*
Family: Fabaceae
Toxic part(s): Fruit pulp, seeds
Toxin(s): Anthraquinones (chrysophanic acid, rhein)
Primary Clinical Effects: Cathartic effect, diarrhoea, weakness, dehydration.

13. Local name: Karabi / Raktakarabi
English name: Oleander (red/pink)
Scientific name: *Nerium oleander*
Family: Apocynaceae
Toxic part(s): All parts (leaves, flowers, sap, wood smoke)
Toxin(s): Cardiac glycosides: oleandrin, neriin
Primary Clinical Effects: Cardiotoxicity: arrhythmias, hyperkalaemia, heart block, sudden death.

14. Local name: Safed Karabi
English name: Yellow oleander
Scientific name: *Thevetia peruviana*
Family: Apocynaceae

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Toxic part(s): All parts (especially seeds, fruits)
Toxin(s): Cardiac glycosides: thevetin A and B, neriifolin
Primary Clinical Effects: Cardiotoxicity, nausea, vomiting, sinus bradycardia, death.

15. Local name: Madar / Aak
English name: Crown flower / Giant milkweed
Scientific name: *Calotropis procera (or C. gigantea)*
Family: Apocynaceae
Toxic part(s): Latex, leaves, roots
Toxin(s): Cardiac glycosides: calotropin, calotoxin, uscharin
Primary Clinical Effects: Gastrointestinal irritation, salivation, diarrhoea, digitalis-like cardiac effects.

16. Local name: Bot
English name: Banyan tree
Scientific name: *Ficus benghalensis*
Family: Moraceae
Toxic part(s): Milky latex
Toxin(s): Furocoumarins, proteolytic enzymes
Primary Clinical Effects: Contact dermatitis (oral/ocular), gastrointestinal irritation.

17. Local name: Kalo aak
English name: Snake weed / Indian heliotrope
Scientific name: *Heliotropium indicum*
Family: Boraginaceae
Toxic part(s): Whole plant (especially seeds)
Toxin(s): Pyrrolizidine alkaloids (heliotrine, lasiocarpine)
Primary Clinical Effects: Chronic hepatotoxicity, pulmonary fibrosis, "walkabout disease" in horses.

18. Local name: Ulukhar / Ban pat
English name: Wild tobacco
Scientific name: *Nicotiana plumbaginifolia (or N. tabacum)*
Family: Solanaceae
Toxic part(s): Leaves
Toxin(s): Nicotine, nornicotine, anabasine
Primary Clinical Effects: Nicotinic effects: salivation, tremors, weakness, respiratory paralysis.

19. Local name: Banbhaji / Chenchi
English name: Spiny amaranth
Scientific name: *Amaranthus spinosus*
Family: Amaranthaceae
Toxic part(s): Whole plant (dried/weathered)
Toxin(s): Nitrates, oxalates
Primary Clinical Effects: Nitrate poisoning (methemoglobinemia), oxalate nephrosis.

20. Local name: Lakshmana / Sukhadarshan
English name: Glory lily / Flame lily
Scientific name: *Gloriosa superba*
Family: Colchicaceae

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Toxic part(s): Tubers, seeds (all parts)
Toxin(s): Colchicine, gloriosine
Primary Clinical Effects: Gastrointestinal haemorrhage, bone marrow suppression, multi-organ failure.

21. Local name: Ban sorisha / Asuri
English name: Wild mustard / Charlock
Scientific name: *Sinapis arvensis (or Brassica spp.)*
Family: Brassicaceae
Toxic part(s): Seeds, seed meal
Toxin(s): Isothiocyanates, sinigrin (glucosinolate)
Primary Clinical Effects: Gastrointestinal irritation, haemoglobinuria, anaemia (high doses).

22. Local name: Peepal
English name: Sacred fig / Peepal
Scientific name: *Ficus religiosa*
Family: Moraceae
Toxic part(s): Milky sap
Toxin(s): Furocoumarins
Primary Clinical Effects: Mild contact dermatitis, gastrointestinal irritation upon ingestion of leaves.

23. Local name: Kharikhat / Bor pat
English name: Indigo / Indian indigo
Scientific name: *Indigofera tinctoria*
Family: Fabaceae
Toxic part(s): Leaves, young pods
Toxin(s): Indospicine, nitrotoxins
Primary Clinical Effects: Hepatotoxicity, teratogenic effects, nitrotoxin poisoning (prolonged feeding).

24. Local name: Malkangni / Jotishmati
English name: Staff tree / Intellect tree
Scientific name: *Celastrus paniculatus*
Family: Celastraceae
Toxic part(s): Seeds, seed oil
Toxin(s): Celastrin, paniculatin
Primary Clinical Effects: Emetic, purgative, CNS depression, hepatotoxicity (oil form).

25. Local name: Ganja / Bhang
English name: Cannabis/Hemp
Scientific name: *Cannabis sativa*
Family: Cannabaceae
Toxic part(s): Leaves, flowers, resin, edibles
Toxin(s): THC, CBD
Primary Clinical Effects: Depression, incoordination, vomiting, dilated pupils, tremors, seizures (severe).

26. Local name: Dudh Kochu
English name: Elephant Ear

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Scientific name: *Alocasia spp. Or Colocasia esculanta*
Family: Araceae
Toxic part(s): All parts and toxic when raw
Toxin(s): Calcium Oxalate Crystals (Raphides)
Primary Clinical Effects: Immediate, intense burning and swelling of mouth, throat, and skin caused by needle like crystals.

27. Local Name: Dhekia
English Name: Bracken Fern
Scientific Name: *Pteridium aquilinum*
Family: Dennstaedtiaceae
Toxic Part(s): All parts (rhizomes, fronds, spores)
Toxin(s): Ptaquiloside, Thiaminase
Primary Clinical Effects: In cattle – bracken staggers (hemorrhage), enzootic hematuria (bladder tumors), in horses – thiamine deficiency, incoordination, tremors, wheeling movements.

28. Local Name: Champa / Golachin
English Name: Frangipani, Temple Tree
Scientific Name: *Plumeria rubra*
Family: Apocynaceae
Toxic Part(s): Milky sap in stems, leaves, bark
Toxin(s): Iridoid glycosides (plumieride)
Primary Clinical Effects: Skin rash, blistering, mouth/throat irritation, vomiting, diarrhoea (mild gastrointestinal upset in pets).

29. Local Name: Pokmou
English Name: Black Nightshade,
Scientific Name: *Solanum nigrum*
Family: Solanaceae
Toxic Part(s): Unripe green berries, mature leaves, and stems
Toxin(s): Solanine, solasonine, solamargine, and saponins
Primary Clinical Effects: Hypersalivation, weakness, muscle tremors, incoordination, CNS depression, dilated pupils, slow heart rate, vomiting, diarrhoea.

30. Local name: Dhatura (Kala Dhatura)
English name: Devil's trumpet
Scientific name: *Datura metel* L.
Family: Solanaceae
Toxic part(s): All parts (especially seeds)
Toxin(s): Hyoscyamine, atropine, scopolamine
Primary Clinical Effects: Anticholinergic syndrome (mydriasis, tachycardia, dry mouth, delirium, hyperthermia, seizures, death).

3.2 Most Frequently Reported Toxic Plants
The 5 plants most commonly recognized by farmers as “poisonous to livestock” are shown in table 1:

Rank	**Plants**	**Pictures**	**Farmer recognition (%)**	**Livestock deaths**

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				reported (% of farmers)
1	*Parthenium hysterophorus*		98.8	63.5
2	*Lantana camara*		91.7	41.2
3	*Ricinus communis*		81.2	48.2
4	*Datura stramonium*		78.8	15.3

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5	*Ageratum conyzoides*		58.8	5.9

3.3 Seasonal Pattern of Poisoning Incidents

Sixty-three percent of poisoning incidents occurred during the dry/winter season (November–February), when fodder was scarce, and animals grazed more widely on low-quality forage including dried weeds. Twenty-five percent occurred in the pre-monsoon hot season (March–May) as new weeds emerged rapidly. Only 12% occurred in the monsoon (June–October), when green grass was abundant.

3.4 Clinical Signs Observed

Farmers most commonly observed the following clinical signs in poisoned animals:

- Digestive signs (78% of all poisoning reports): Salivation, vomiting/regurgitation, colic, diarrhoea (sometimes bloody), constipation.
- Nervous signs (65%): Tremors, incoordination, circling, convulsions, paddling, recumbency.
- Cardiorespiratory signs (42%): Tachycardia (rapid heart rate), dyspnoea (difficulty breathing), cyanosed mucous membranes.
- Photosensitization (23%): Swelling, redness and crusting on unpigmented skin (muzzle, udder, around eyes) after sunlight exposure, associated with *Lantana camara* and *Ageratum conyzoides*.

3.5 Economic Impact Estimates

Over the two-year recall period (March 2023 – February 2025), responding farmers reported:

- Total animal deaths attributable to plant poisoning: 67 cattle (18 adult, 49 calves) and 112 goats, representing an average annual mortality of 4.2% of the total herd across affected farms.
- Estimated direct financial loss: ₹21.7 lakh (approximately US$25,300) from livestock deaths alone.

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- Treatment costs: An average of ₹480 per poisoning event, with each affected farm experiencing 3.5 events per year, totalling approximately ₹140,000 (US$1,630) across surveyed farms.
- Milk production loss: Farmers with lactating cows that survived poisoning reported a 35–50% milk yield drop lasting 2–4 weeks, equivalent to an estimated annual loss of ₹800–1,500 per cow.

The combined estimated economic burden across the 85 surveyed households was approximately ₹26.4 lakh (US$30,800) per year, or roughly ₹31,000 (US$360) per affected household per year. Nationally, extrapolation of poisoning data suggests that livestock farming suffers significant preventable economic losses from plant poisoning across India.

4. Discussion

This study provides the first systematic documentation of toxic plants affecting livestock in Khanapara, a major livestock hub of Northeast India. The 30 species recorded represent a substantial poisoning risk, with *Parthenium hysterophorus, Lantana camara* and *Ricinus communis* emerging as the most dangerous plants based on both recognition frequency and reported mortality. These findings are consistent with studies from other Indian states, which have similarly identified these three species as leading causes of plant poisoning in ruminants.

4.1 Invasive Weeds as the Primary Threat

Parthenium hysterophorus is arguably the most serious threat. The plant contains parthenin, a sesquiterpene lactone that causes dermatitis upon contact and bitter milk as well as liver damage upon ingestion. Sixty-three percent of farmers in this study reported livestock deaths following consumption of grass contaminated by *Parthenium*. The weed has rapidly colonized fallow lands and road verges in Khanapara, partly driven by urbanization and soil disturbance.

Lantana camara is another invasive shrub that has spread extensively across degraded grazing lands of Kamrup district. The toxic principle lantadenes cause dose-dependent hepatotoxicity and secondary photosensitization. Poisoning typically occurs during times of fodder scarcity when hungry animals, particularly cattle, consume the otherwise unpalatable green leaves. The classic clinical signs—icterus (jaundice), severe diarrhoea, soft black faeces and photosensitization—were described by multiple farmers.

4.2 Seasonality and Fodder Scarcity Loop

A strong seasonal pattern of poisoning emerged, with 63% of incidents occurring in the dry winter months (November–February). This coincides precisely with the seasonal green fodder deficit documented in our previous Khanapara study (62% decline in winter biomass). The

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synergy between fodder scarcity and plant poisoning creates a "fodder-scarcity-to-poisoning loop": when high-quality forage is unavailable, animals graze more widely, consume toxic weeds they would normally avoid, and present with poisoning more frequently.

This pattern has also been observed in multiple regions of India, where fodder shortages are well-documented. The phenomenon underscores the need for integrated interventions addressing both fodder security and pasture management.

4.3 High-Risk Plants with Specific Toxic Syndromes

Beyond the major invasive weeds, several other plants pose significant but more context-specific risks:

- *Ricinus communis* (castor bean): Seeds contain ricin, one of the most potent plant toxins known, with an estimated lethal dose of 1–2 seeds per goat and 5–10 seeds per adult cow. Poisonings peak when farms store castor bean meal (oil extraction residue) or when animals access seed pods.
- *Datura stramonium* (jimsonweed): The tropane alkaloids (atropine, scopolamine) produce a classic anticholinergic syndrome: mydriasis (dilated pupils not responsive to light), tachycardia, dry mucous membranes, hyperthermia, ileus (gut stasis) and central nervous system excitement followed by depression. Livestock rarely consume Datura leaves but may accidentally ingest seeds when the seed capsules break open.
- *Abrus precatorius* (rosary pea): Seeds contain the toxalbumin abrin, whose toxicity is comparable to that of ricin. However, whole seeds are often passed unharmed if swallowed intact because of the hard seed coat. Poisoning occurs when seeds are crushed (e.g., during feed processing) or when extracts are injected—the latter has been reported as a method of malicious poisoning in India.
- *Jatropha curcas*: The seeds cause violent purgation, haemorrhagic gastroenteritis and circulatory collapse. Numerous poisoning incidents have been documented during years of fodder shortage when seeds are inadvertently mixed with feed.
- Plants causing cyanide poisoning: Several plants in Khanapara contain cyanogenic glycosides, including the young shoots of *Bambusa spp.* Acute poisoning is characterized by bright red blood, dyspnoea, convulsions and sudden death with minimal pre-monitory signs.
- *Gloriosa superba* (glory lily): All parts contain colchicine, which arrests cell division at metaphase. Signs include severe haemorrhagic gastroenteritis, bone marrow suppression and multi-organ failure.

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- Pyrrolizidine alkaloid (PA) plants: *Ageratum conyzoides*, contain pyrrolizidine alkaloids that cause chronic, cumulative hepatotoxicity. Affected animals may show no immediate illness but develop liver cirrhosis, photosensitization, wasting and death weeks to months after ingestion.

4.4 Economic Burden Is Substantial

The estimated annual loss of approximately ₹2.64 million across 85 surveyed households represents a significant economic drain on already vulnerable smallholders. Nationally, plant poisoning is increasingly recognized as an emerging threat to livestock health in India, particularly in rural regions where livestock are frequently exposed to toxic flora. In Assam specifically, recent reports have documented large-scale livestock deaths from plant poisoning, including 40 cattle deaths in Majuli and 75 goat deaths in Kamrup district, with losses exceeding ₹20 lakh in a single incident. The true scale remains larger, as these events are often not systematically recorded.

4.5 Knowledge Gaps and Farmer Awareness

A concerning finding of this study was the low level of systematic knowledge about plant poisoning among farmers. Although most respondents had heard of "poisonous weeds", fewer than 20% could name the specific toxic plant that had killed their animals, and fewer than 10% were aware of preventive measures (e.g., avoiding grazing in heavily infested areas for 3–4 weeks after weed emergence). This knowledge gap highlights an urgent need for locally relevant extension materials in Assamese and Bengali, including a visual guide to the top most dangerous plants in the Khanapara area.

4.6 Study Limitations

Several limitations should be acknowledged. First, plant identification relied on field collection and local nomenclature; problems occurred in certain specimens' identification. Second, confirmation of poisoning through laboratory analysis (e.g., serum biochemistry, post-mortem examination, plant toxin detection in ingesta), was not conducted due to resource constraints. Third, the economic impact estimate is based on farmer recall and may be subject to both under-reporting and over-estimation.

5. Conclusion

This study demonstrates that plant poisoning is a frequent, seasonal and economically damaging problem for livestock farmers in Khanapara. Thirty toxic species were documented, with *Parthenium hysterophorus*, *Lantana camara* and *Ricinus communis* accounting for the majority of livestock illness and death. Fodder scarcity during the winter months forces animals to consume these otherwise unpalatable weeds, creating a synergistic

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"fodder-scarcity-to-poisoning loop". The estimated annual economic loss of approximately ₹31,000 per affected household represents a significant burden for smallholder families.

6. Recommendations

Based on the findings, the following interventions are recommended:

For farmers and community:

1. Develop a visual identification guide with photographs of the 10 most dangerous plants (Assamese/Bengali captions) and distribute through veterinary hospitals and livestock markets.
2. Implement "poison-plant free" grazing periods for 3–4 weeks following the first flush of winter rain, when toxic weeds emerge rapidly.
3. Establish community early-warning systems whereby farmers report poisoning incidents to veterinary authorities for epidemiological mapping.

For veterinary services:

4. Train field veterinarians in recognition and treatment of common plant poisoning syndromes (e.g., use of atropine for anticholinergic poisoning, methylene blue for nitrate poisoning).
5. Stock essential emergency medicines (activated charcoal, atropine sulphate, sodium thiosulphate, methylene blue) at primary veterinary centres in Kamrup district.

For agricultural extension:

6. Promote intensive pasture management including rotational grazing, mechanical removal of *Parthenium spp.* and *Lantana spp.* before seed set, and biological control (leaf-feeding beetles).
7. Integrate plant poison education into existing fodder-scarcity mitigation programmes (hydroponics, silage making, fodder banks).

For future research:

8. Conduct analytical confirmation of poisoning through serum biochemistry, necropsy and plant toxin assays.
9. Evaluate the efficacy and practicality of biological control agents for *Lantana* and *Parthenium* under the agro-climatic conditions of lower Assam.

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