PREPARED UNDER

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AGRICULTURE

Table 1: Key Categories under the Agriculture Sector

Categories	Remarks
3 - Agriculture, Forestry, and Other Land Use	
3.A - Livestock	Estimated
3.A.1 - Enteric Fermentation	Estimated
3.A.2 - Manure Management	Estimated
3.C - Aggregate Sources and non-CO2 emissions sources on land	
3.C.6 - Indirect N2O Emissions from manure management	Estimated

Emissions from the Agriculture Sector

The emissions attributed to the Agricultural Livestock sector were derived from several specific categories:

- Enteric Fermentation
- Manure Management
- Indirect N2O Emissions from Manure Management

The calculations for these emissions were based on data sourced from the Food and Agriculture Organization (FAO) statistics along with agricultural livestock data.

Agriculture stands out as one of the most significant contributors to greenhouse gas (GHG) emissions in Vanuatu. This is evidenced by the data presented in Tables 1.1 to 1.3, which illustrate substantial GHG emission values recorded over the years.

Over a period from 1990 to 2022 the biggest contributors to greenhouse gas emissions from the agriculture livestock comes from the Enteric fermentation which accompanies 81% of the emissions in total. Second to that is the manure management which constitutes for 18% of the GHG emissions from 1990 to 2022. Lastly the least contributing would be the indirect N2O emissions form manure management (See Figure 1 and 2)

Table 1.1: Agriculture Sector GHG Emissions (Gg CO_2-e): 1990 - 1999

Categories	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
3 - Agriculture , Forestry , and Other Land Use										
3.A - Livestock	259.054	267.2276	286.0683	304.008	305.7962	305.7962	306.334	306.334	306.8738	306.8761
3.A.1 - Enteric Fermentation	214.3604	222.8024	293.7424	256.5928	258.2728	258.2728	258.2954	258.2954	258.3179	258.3179
3.A.2 - Manure Management	44.6936	44.4251	46.3258	47.4152	47.5234	47.5234	48.0386	48.0386	48.556	48.5582
3.C.6 - Indirect N2O Emissions from manure management	3.1369	3.176	3.2555	3.335	3.3428	3.3428	3.3782	3.3782	3.4147	3.4158
AFOLU Sector Total	262.1909	270.4037	289.3238	307.3429	309.139	309.139	309.7122	309.7122	310.2885	310.2918

Table 1.2: Agriculture Sector GHG Emissions (Gg CO_2-e): 2000 - 2010

Categories	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3 - Agriculture , Forestry , and Other Land Use											
3.A - Livestock	289.3556	272.5484	274.8435	285.6194	292.8184	297.6194	304.378	362.9631	366.0168	339.8866	349.411
3.A.1 - Enteric Fermentation	239.9279	223.1729	223.4029	232.0805	237.398	240.943	246.1236	299.0497	300.7588	276.1943	284.6977
3.A.2 - Manure Management	49.4277	49.3755	51.4406	53.5389	55.4204	56.6764	58.2544	63.9135	65.258	63.6923	64.7133
3.C.6 - Indirect N2O Emissions from manure management	3.4712	3.4637	3.6053	3.7529	3.8848	3.9734	4.0838	4.4998	4.6098	4.4918	4.545
AFOLU Sector Total	292.8268	276.0121	278.4488	289.3723	296.7032	301.5929	308.4618	367.4629	370.6265	344.3784	353.956

Table 1.3: Agriculture Sector GHG Emissions (Gg CO_2-e): 2011 - 2022

Categories	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
3 - Agriculture , Forestry , and Other Land Use												
3.A - Livestock	359.4286	363.522	365.9482	359.3322	328.2687	260.3575	231.0463	232.2224	232.0095	231.8108	231.8693	258.1428
3.A.1 - Enteric Fermentation	293.1224	296.4848	298.2681	301.5009	263.8067	201.3841	175.0041	177.1824	177.4377	178.0063	178.8609	1947.955
3.A.2 - Manure Management	66.3062	67.0373	67.6901	57.8313	64.462	58.9735	56.0422	55.04	54.5718	53.8045	53.0084	63.1876
3.C.6 - Indirect N2O Emissions from manure management	4.6657	4.7168	4.7654	3.9122	4.5252	3.6684	3.4742	3.4207	3.3953	3.3515	3.301	3.88
AFOLU Sector Total	364.0943	368.2388	370.7136	363.2444	332.794	264.0259	234.5205	235.6431	235.4049	235.1622	235.1703	262.0228

(Note: The arrangement of tables has been separated for space considerations.)

Figure 1: Agriculture Sector Emissions Gg CO_2-e: 1990 - 2022

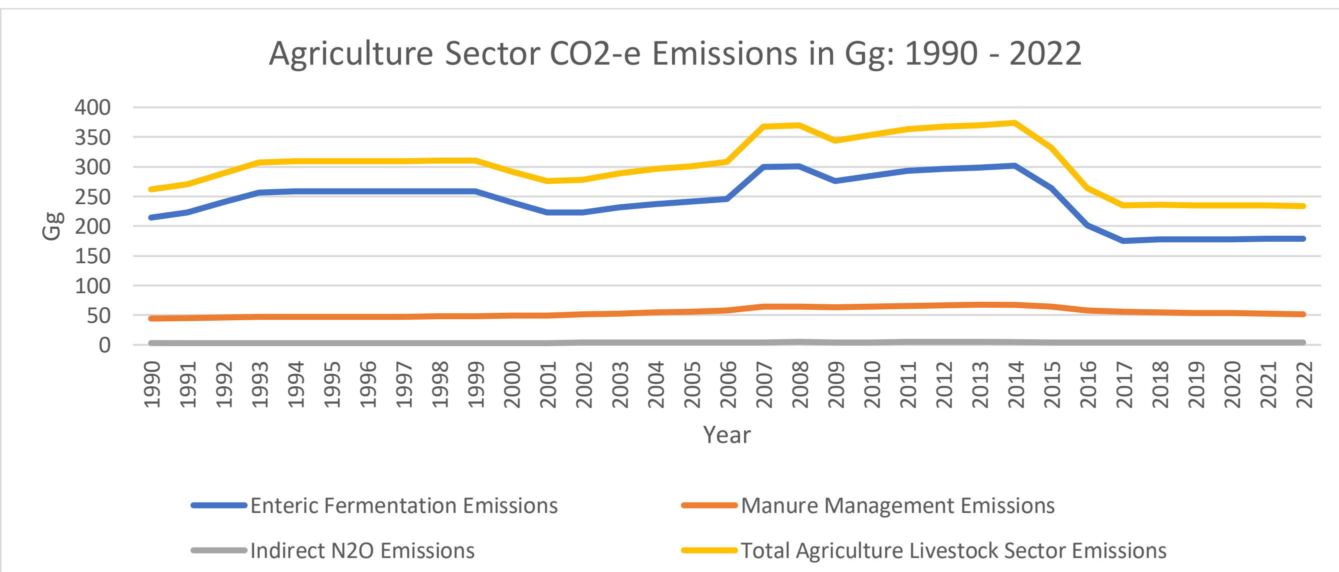


Figure 1: Gives a trend and disparity between which agricultural practices that contribute mostly to the green house gas emissions. Enteric With the highest GHG Emissions, then Manure Management and very little coming from the Indirect N2O.

Figure 2: Agricultural Livestock Sector GHG Emission share: 1990 - 2022

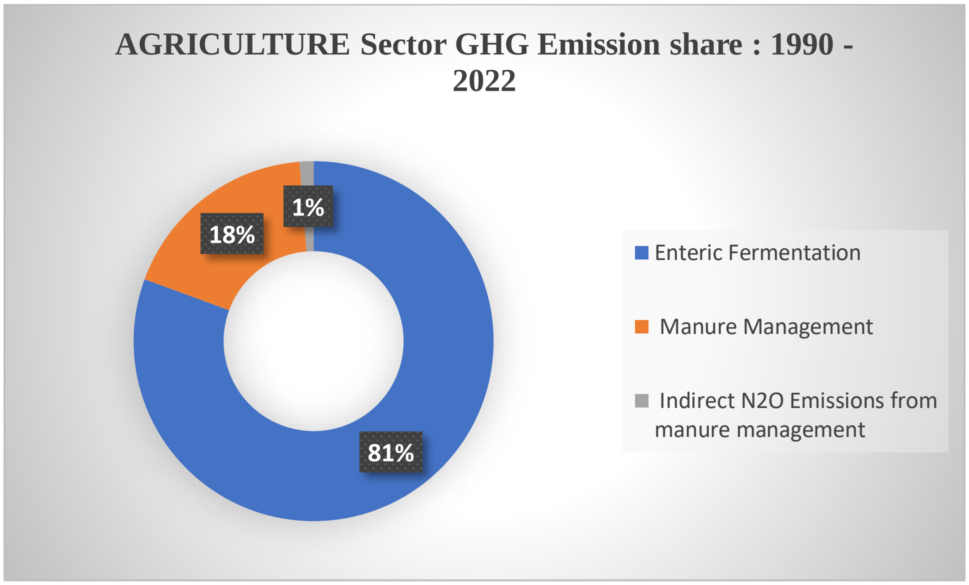


Figure 2: indicates that the predominant source of greenhouse gas (GHG) emissions within the agriculture sector in Vanuatu is Enteric Fermentation, which accounts for a substantial 81% of total GHG emissions. Following this, Manure Management ranks second, contributing 18% to the overall emissions. Lastly, there is a minor contribution from Indirect N_2O emissions resulting from manure management, which makes up just 1%.

LIVESTOCK

Significance of Livestock in Vanuatu

Livestock production is crucial to Vanuatu's economy, significantly contributing to local consumption through beef, pork, poultry, and goat farming. Enhancements in livestock production can boost farmers' incomes and foster rural enterprises like butcheries, thereby supporting local economies and ensuring access to fresh, nutritious food. This improvement also increases food safety and availability. Additionally, livestock holds cultural importance, particularly pigs in customary ceremonies. The farming and selling of livestock create employment opportunities for rural communities, further promoting economic stability.

Vanuatu's beef export industry has growth potential due to its strong animal health status and compliance with strict import standards from countries such as Australia, Japan, and New Zealand, enhancing export market opportunities.

The livestock sector contributes to sustainable agriculture by integrating cattle grazing with coconut plantations or other crops. This method optimizes land use while preserving ecological balance, boosting productivity and promoting environmental sustainability.

Livestock Activity data

This Inventory utilizes FAO agricultural census data to estimate GHG emissions from Vanuatu's livestock sector. The table below presents livestock production activity data from 1990 to 2022.

Vanuatu's livestock primarily includes poultry, cattle, swine, goats, and horses. Poultry, particularly chicken, is the most common type of livestock, accounting for 67% of total livestock production due to its popularity among both subsistence and commercial farmers (see Figure 3).

Cattle are the second most produced livestock in Vanuatu and a key export commodity. From 1990 to 2022, cattle represented 20% of the country's livestock production (see Figure 3)

Swine farming is less prevalent than cattle but is still practiced by both commercial and subsistence farmers, contributing to 11% of livestock production during the same period (see Figure 3).

Goats and horses are the least common types of livestock. Goats are not widely consumed or farmed due to low demand. Horses are not used for consumption or draft purposes; instead, they are primarily involved in tourism-related activities such as riding programs (see Figure 3).

Table 2.1: Livestock Population: 1990 - 1999

Livestock Population	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Cattle	125000	130000	140000	150000	151000	151000	151000	151000	151000	151000
Goats	10700	11000	12000	12000	12000	12000	12000	12000	12000	12000
Horses	3000	3000	3000	3100	3100	3100	3100	3100	3100	3100
Swine	60000	60000	60000	60000	60000	60000	61000	61000	62000	62000
Poultry	300000	320000	310000	320000	320000	320000	320000	320000	330000	340000
Total	498700	524000	525000	545100	546100	546100	547100	547100	558100	568100

Table 2.2: Livestock Population: 2000 - 2009

Livestock Population	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cattle	140000	130000	130000	135000	138000	140000	142915	174137	175000	160000
Goats	12000	12000	13000	14500	16000	17000	18456	17907	17769	17628
Horses	3100	3100	3100	3100	3100	3100	3100	4000	4500	5800
Swine	66000	68000	72000	75000	78000	80000	82432	88694	89000	89000
Poultry	340000	340000	340000	360000	380000	400000	413000	600000	804000	800000
Total	561100	553100	558100	587600	615100	640100	659903	884738	1090269	1072428

Table 2.3 Livestock Population: 2010 - 2029

Livestock Population	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Cattle	165000	170000	172000	173000	175000	152403	115540	100000	101535	102100
Goats	17486	17341	17197	17054	16910	16767	16288	15444	14363	12642
Horses	6000	6000	6000	6200	6500	6646	5929	5726	5328	4474
Swine	90000	92000	93000	94000	94000	92089	89305	86905	84674	83745
Poultry	600000	700000	700000	750000	689000	647000	515000	519000	538000	523000
Total	878486	985341	988197	1040254	981410	914905	742062	727075	743900	725961

Table 2.4 Livestock Population 2020 - 2022

Livestock Population	2020	2021	2022
Cattle	102776	103635	103825
Goats	11100	9484	6886
Horses	3850	3193	2303
Swine	82191	80656	78928
Poultry	504000	484000	414000
Total	703917	680968	605942

(Note: The arrangement of tables has been separated for space considerations.)

Figure 3: Livestock Activity data

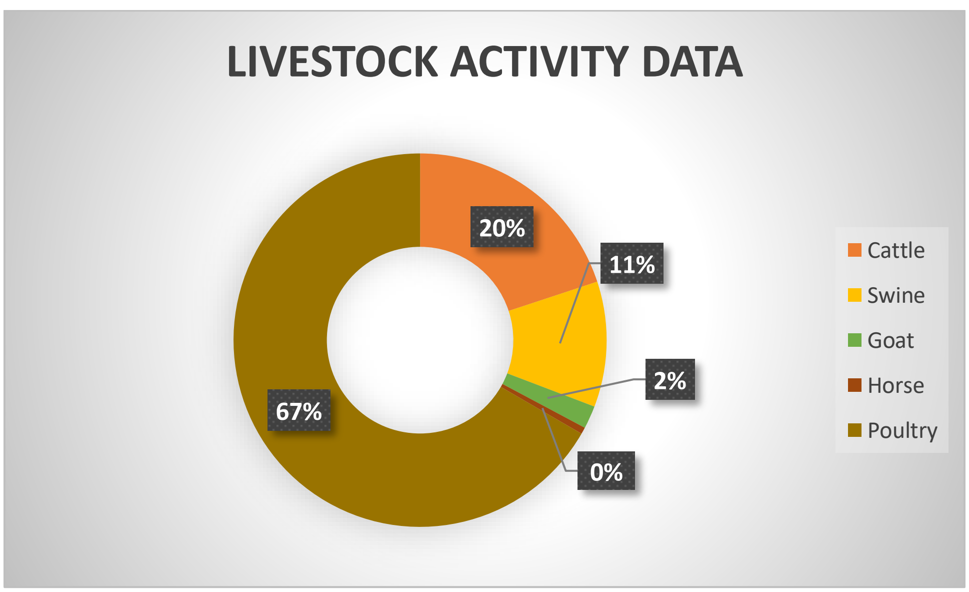


Figure 3: depicts which livestock is produced more in Vanuatu. Poultry leading with 67%, Second Cattle due then Swine and Goat. Horses are not a common livestock in Vanuatu.

Enteric Fermentation

Enteric fermentation is a natural digestive process occurring in the stomachs of ruminant animals. In this process, microorganisms like bacteria, protozoa, and fungi decompose complex carbohydrates from plant materials into simpler compounds. This fermentation generates volatile fatty acids (VFAs), which are a key energy source for the animal. Additionally, methane (CH4) is produced as a byproduct and released into the atmosphere through burping or exhalation. Enteric fermentation is crucial for digestion and nutrient absorption in these animals.

Enteric fermentation has accounted for 81% of emissions, as shown in figure 2. Over the census years, many large commercial livestock farms have failed to provide accurate production data or have not submitted reports at all. This lack of reliable data has resulted in an unstable representation of livestock numbers in Vanuatu, thereby impacting the CH4 emissions illustrated in figure 4.

In Vanuatu, the livestock that contribute to enteric fermentation primarily consist of cattle, pigs, goats, and horses. Tables 3.1 to 3.3 present data regarding the greenhouse gas emissions, specifically methane (CH4), produced from enteric fermentation by each type of livestock, along with the total carbon dioxide equivalent (CO2-e) generated annually from 1990 to 2022.

The inventory calculations for enteric fermentation employed the Tier 1 Method due to insufficient country-specific parameters, relying instead on default values. Estimates spanning from 1990 to 2022 reveal that cattle are responsible for the vast majority of methane emissions from enteric fermentation, contributing 97%, while goats, pigs, and horses collectively account for only 1% (refer to figure 4). Tables 3.1: Table 3.2: Gg CH4 and Total CO2 from Enteric Fermentation for each livestock type: 1990 – 1999

Table 3.1: Greenhouse Gas Emissions of CH4 and Total CO2 Equivalent from Enteric Fermentation by Livestock Type: 1990 - 1999

	YEAR	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gg CH4(g) ENTERIC FERMENTATION: 1990 - 2022	Cattle	7.5	7.8	8.4	9	9.06	9.06	9.06	9.06	9.06	9.06
	Swine	0.048230137	0.04823	0.048230137	0.04823	0.04823	0.04823	0.04903	0.049034	0.049838	0.04984
	Goat	0.0535	0.055	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Horse	0.054	0.054	0.054	0.0558	0.0558	0.0558	0.0558	0.0558	0.0558	0.0558
	Total Gg CH4(g) Emissions from Enteric Ferementation	7.655730137	7.95723	8.562230137	9.16403	9.22403	9.22403	9.22483	9.224834	9.225638	9.22564
Total CO2 eq		214.3604	222.802	239.7423948	256.593	258.2728	258.273	258.295	258.2953	258.3178	258.318

Table 3.2: Greenhouse Gas Emissions of CH4 and Total CO2 Equivalent from Enteric Fermentation by Livestock Type: 2000 - 2010

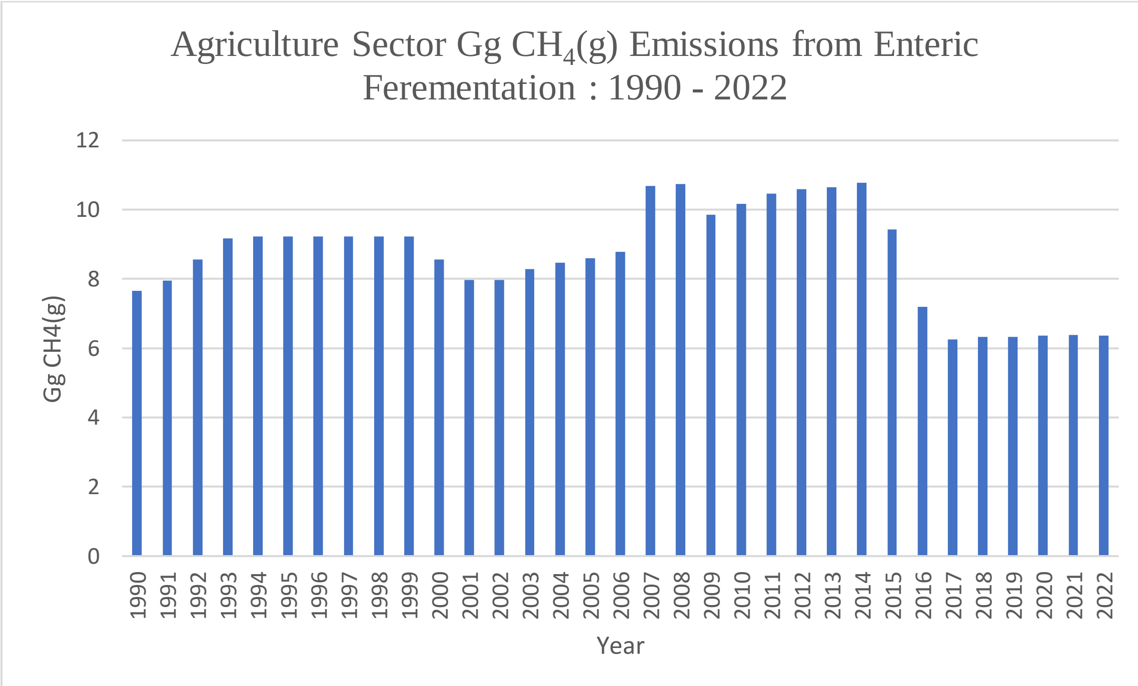
	YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Gg CH4(g) ENTERIC FERMENTATION: 1990 - 2022	Cattle	8.4	7.8	7.8	8.1	8.28	8.4	8.5749	10.44822	10.5	9.6	9.9
	Swine	0.053053151	0.05466	0.057876164	0.06029	0.062699	0.06431	0.06626	0.071295	0.071541	0.07154	0.07235
	Goat	0.06	0.06	0.065	0.0725	0.08	0.085	0.09228	0.089535	0.088845	0.08814	0.08743
	Horse	0.0558	0.0558	0.0558	0.0558	0.0558	0.0558	0.0558	0.072	0.081	0.1044	0.108
	Total Gg CH4(g) Emissions from Enteric Ferementation	8.568853151	7.97046	7.978676164	8.28859	8.478499	8.60511	8.78924	10.68105	10.74139	9.86408	10.1678
Total CO2 eq		239.9278391	223.173	223.4028869	232.08	237.3979	240.943	246.099	299.0693	300.7588	276.194	284.698

Table 3.3 Greenhouse Gas Emissions of CH4 and Total CO2 Equivalent from Enteric Fermentation by Livestock Type: 2011 - 2022

	YEAR	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gg CH4(g) ENTERIC FERMENTATION: 1990 - 2022	Cattle	10.2	10.32	10.38	10.5	9.14418	6.9324	6	6.0921	6.126	6.16656	6.2181	6.2295
	Swine	0.073952877	0.07476	0.075560548	0.07556	0.074024	0.07179	0.06986	0.068064	0.067317	0.06607	0.06483	0.06345
	Goat	0.086705	0.08599	0.08527	0.08455	0.083835	0.08144	0.07722	0.071815	0.06321	0.0555	0.04742	0.03443
	Horse	0.108	0.108	0.1116	0.117	0.119628	0.10672	0.10307	0.095904	0.080532	0.0693	0.05747	0.04145
	Total Gg CH4(g) Emissions from Enteric Ferementation	10.46865788	10.5887	10.65243055	10.7771	9.421667	7.19235	6.25015	6.327883	6.337059	6.35743	6.38783	6.36883
Total CO2 eq		293.1223606	296.485	298.2679943	301.759	263.8066	201.386	175.004	177.1807	177.4376	178.008	178.859	178.327

(Note: The arrangement of tables has been separated for space considerations.)

Figure 4: Agriculture Sector Gg CH_4 Emissions from Enteric Fermentation: 1990 - 200



This graph shows Gg CH4 emissions from different livestock types between 1990 and 2022. The fluctuations in emissions are linked to variations in animal production over the years, explaining why some years have higher CH4 emissions than others.

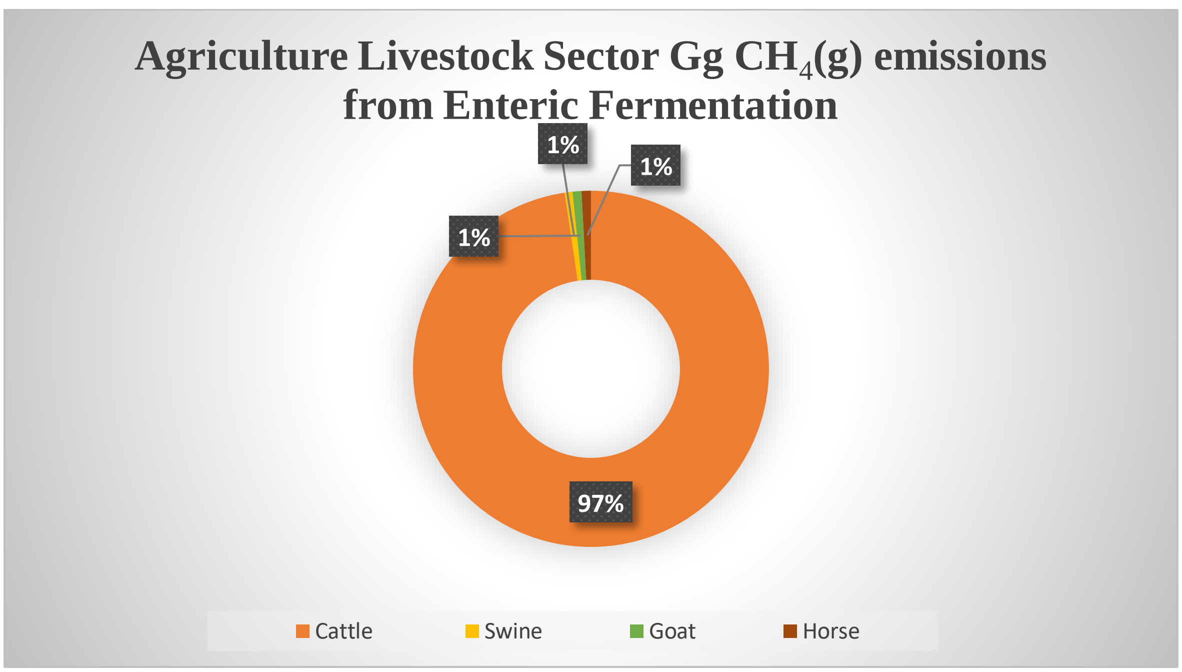
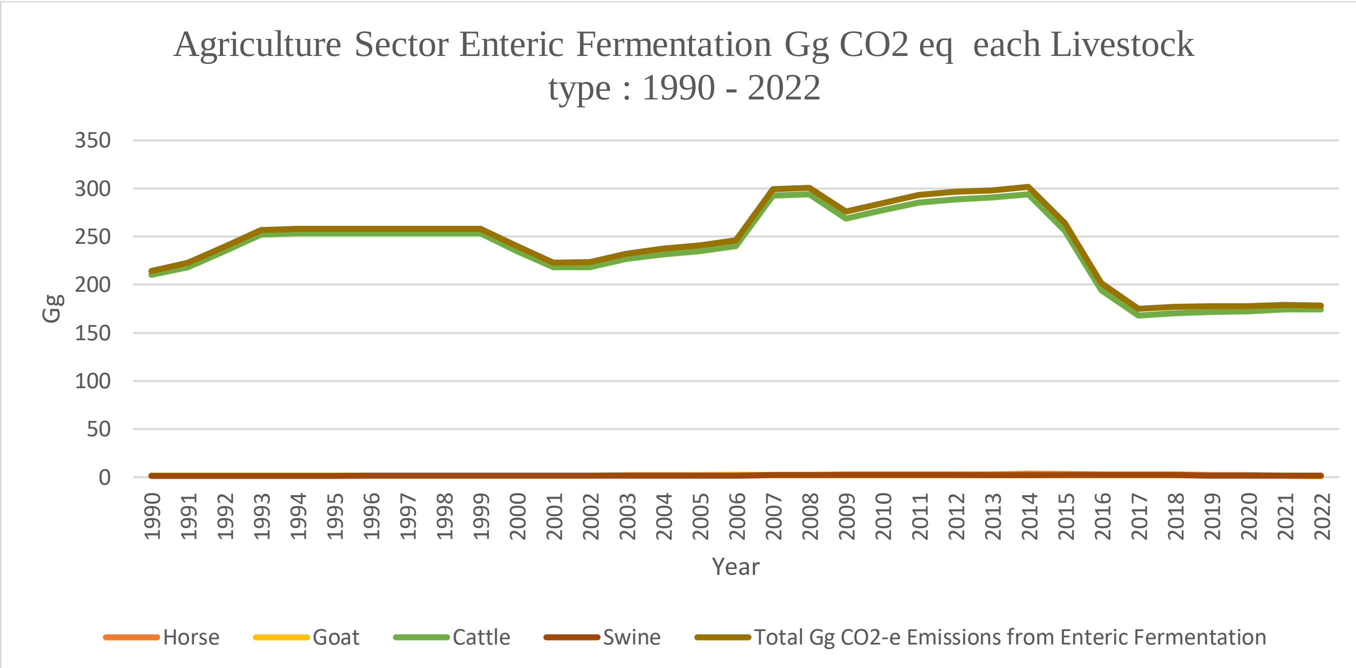


Figure 5: Illustrates that cattle are responsible for the majority of methane emissions, accounting for 97% of the total Gg CH4(g) emitted from 1990 to 2022. In contrast, other livestock such as swine, goats, and horses contribute minimally, with a combined emission value of only 1%.

Figure 6: Agriculture Sector Enteric Fermentation Gg CO_2-e produced by each livestock type: 1990 - 2022



This figure illustrates the CO2-e emissions from various livestock types and the total emissions from enteric fermentation between 1990 and 2022. The data indicate that cattle are the primary contributors to these emissions, while swine, goats, and horses contribute minimally. The total CO2-e emissions do not show a consistent trend due to fluctuations in livestock production over the years.

Manure Management

When evaluating the emissions generated by various manure management systems, it is essential to consider the types of gases produced, their potential environmental impact, and the conditions under which these systems operate. The primary greenhouse gases emitted from manure management include methane (CH4), nitrous oxide (N2O), and ammonia (NH3). Each system has distinct characteristics that influence its emission profile.

For this assessment, N_2O and CH_4 will be analyzed. In the absence of specific parameter values for each country, Tier 1 methodology will be employed to estimate emissions using standard default values.

Methane Gas accounts for 82% of manure management emissions from 1990 to 2022, as illustrated in Figure 7. Methane emissions have consistently led, with nitrous oxide increasing alongside livestock numbers. The data in Figure 8 reflects incomplete submissions from non-commercial farmers, and there has been a decline in the cattle farming sector. Tables 4.1 to 4.3 detail the emissions from manure management for both gases and the total annual CO2-e emitted from the system.

Liquid Slurry systems involve the collection of manure in a liquid state, typically combined with water. Such systems can result in considerable emissions of methane and ammonia due to anaerobic conditions that foster microbial activity. The level of these emissions is influenced by various factors, including the duration of storage, temperature, and whether there is a cover over the slurry. In Vanuatu, swine are the primary livestock utilizing this practice. It is clear that despite being employed solely by swine, the emissions are notably high; as illustrated in figure 5, this practice accounts for 11% of the Gg N2O(g) emissions.

Uncovered Anaerobic Lagoon: Uncovered anaerobic lagoons are large, open pits for storing liquid manure without a cover. This system produces significant methane emissions due to anaerobic decomposition. The absence of a cover allows gases to escape directly into the atmosphere, making it one of the highest-emission manure management systems. Primarily used in swine farming, this method is responsible for 35% of Gg N2O(g) emissions, as illustrated in Figure 5.

Solid storage involves keeping manure in piles or bins, which can reduce emissions compared to liquid systems. However, it still generates nitrous oxide and ammonia during decomposition. Overall, solid storage typically results in lower greenhouse gas emissions than liquid slurry or uncovered lagoons. This method is commonly used in Vanuatu for livestock such as poultry and swine. It accounts for 14% of Gg N2O(g) emissions from enteric fermentation across various livestock types.

Dry lot systems confine animals to a specific area without access to pasture. Manure accumulates on-site but is typically managed through regular removal and composting. Emissions from dry lots can vary significantly based on management practices, though they are generally lower than those from uncovered anaerobic lagoons. This management system is primarily used for cattle and swine, which have larger populations contributing to increased emissions. From 1990 to 2022, this system accounted for approximately 40% of greenhouse gas emissions in the form of N2O.

Pasture-based systems enable animals to graze on grasslands or paddocks. Although they can produce some emissions from manure on soil, their overall greenhouse gas emissions are typically lower than those from intensive confinement systems like uncovered anaerobic lagoons or liquid slurry, due to natural degradation by soil microorganisms. This system is commonly used for cattle, goats, and horses and has shown minimal to no emissions over the years, as illustrated in figure 9, indicating 0% emissions from this manure management approach.

Table 4.1 Agriculture Sector Manure Management Emissions: 1990 - 200

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total N2O Emission Manure Management	0.03207	0.03307	0.03503	0.03701	0.037211	0.03721	0.03733	0.037331	0.037458	0.03746	0.03578
Total CH4 Emissions Manure Management	1.28065	1.29076	1.310903	1.3311	1.333098	1.3331	1.35015	1.350148	1.367228	1.36726	1.41346
Total CO2 eq Manure Management	44.35653	44.9044	45.98911	47.0788	47.18708	47.1871	47.6964	47.69639	48.20828	48.2109	49.0573

Table 4.2: Agriculture Sector Manure Management Emissions: 2001 - 2010

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total N2O Emission Manure Management	0.034046014	0.03453	0.035888061	0.03685	0.037502	0.03838	0.04541	0.04575	0.04279	0.04377
Total CH4 Emissions Manure Management	1.427557973	1.49593	1.557393384	1.61486	1.65319	1.70077	1.87194	1.880306	1.852401	1.87914
Total CO2 eq Manure Management	48.99338995	51.0354	53.1168977	54.9819	56.22694	57.7914	64.4476	64.77183	63.20601	64.2135

Table 4.3: Agriculture Sector Manure Management Emissions: 2011 - 2022

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total N2O Emission Manure Management	0.04506	0.04557	0.04592	0.04628	0.04156	0.03387	0.03052	0.03057	0.03056	0.03049	0.03046	0.03025
Total CH4 Emissions Manure Management	1.9235	1.94455	1.96406	1.96834	1.89065	1.76779	1.69533	1.65958	1.64313	1.616645	1.59078	1.55958
Total CO2 eq Manure Management	65.798	66.5236	67.16260	67.3765	63.9521	58.4744	55.5574	54.5688	54.1056	53.34638	52.61455	51.68374

(Note: The arrangement of tables has been separated for space considerations.)

Figure 7: Agriculture Sector Manure Management (CH_4) and (N_2O) emissions (CO_2 eq): 1990 - 2022

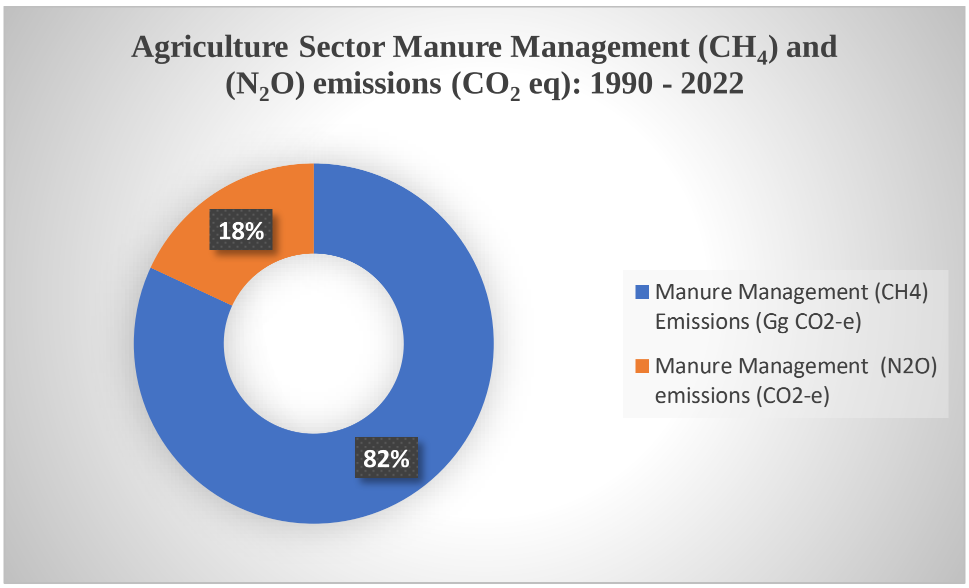
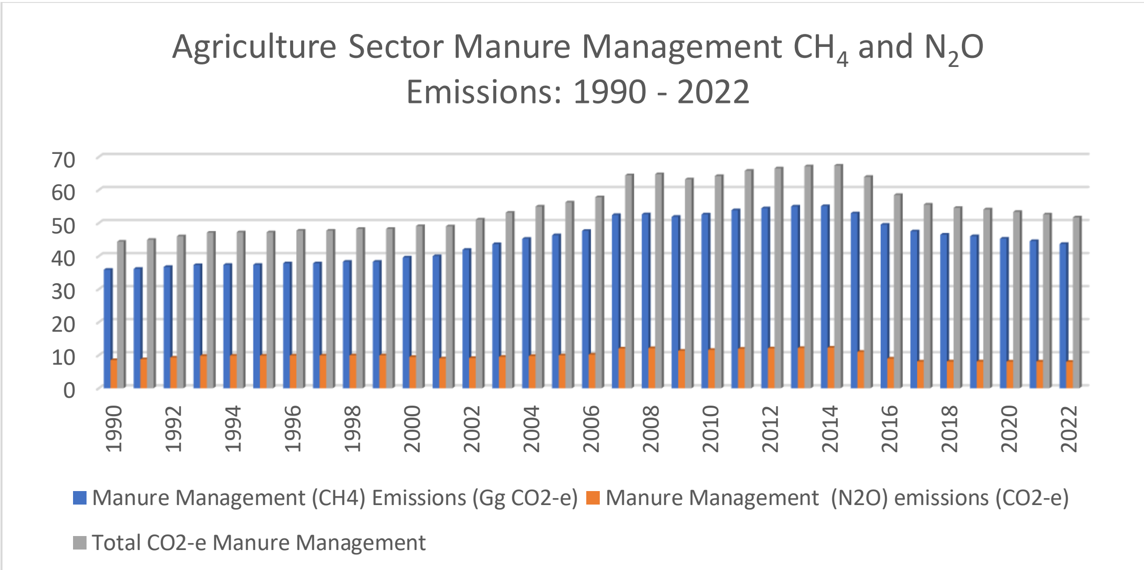


Figure 7: Methane emissions from manure management reached 82%, with Nitrous Oxide contributing 18% from 1990 to 2022.

Figure 8: Agriculture Sector Manure Management: 1990 - 2022



This figure illustrates the total emissions of CH4 (Gg CO2-e), N2O (Gg CO2-e), and total CO2-e from the manure management system. CH4 emissions were higher than N2O emissions, with an overall increase in emissions observed until 2014. The graph reflects annual fluctuations corresponding to changes in animal production populations.

Figure 9: Gg N_2O(g) Emissions from different Manure Management system: 1990 - 2022

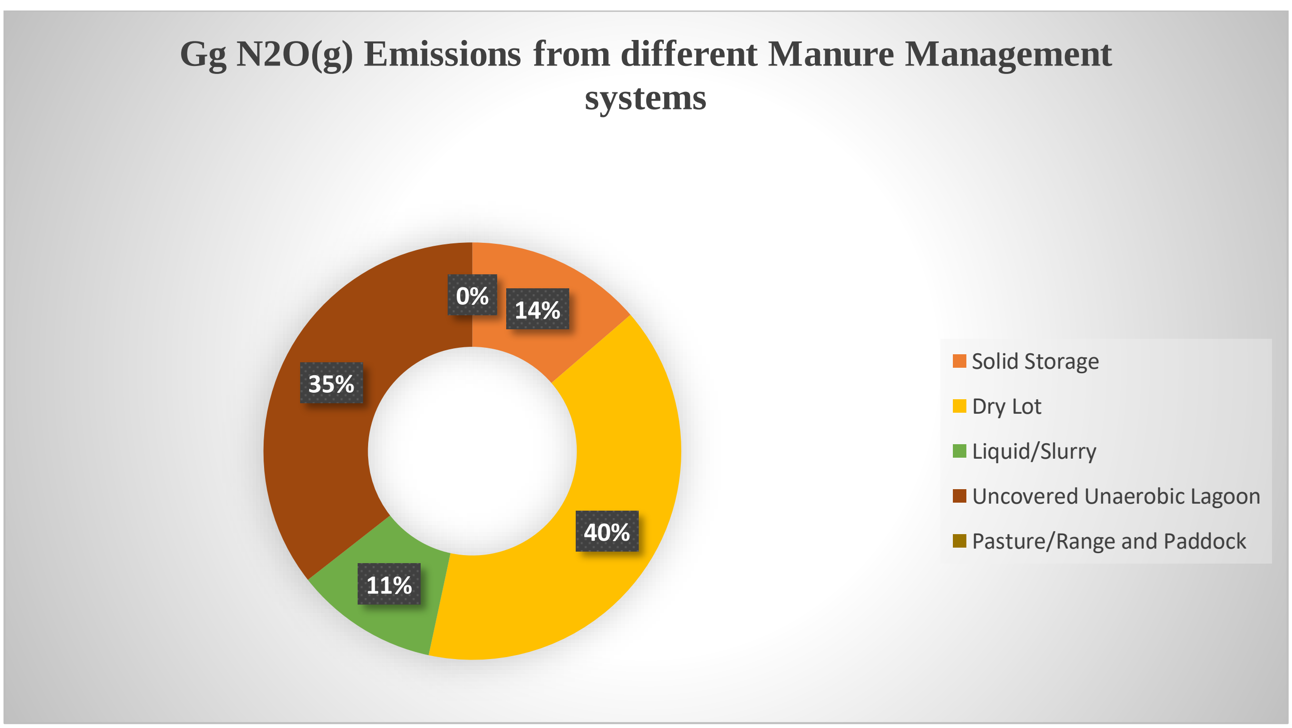


Figure 9 shows the various manure management systems in Vanuatu from 1990 to 2022 and their respective N2O emissions. The Dry lot system emits the highest N2O at 40%, followed by Uncovered Anaerobic Lagoon at

35%. Solid storage and liquid slurry systems emit approximately 14% and 11%, respectively. Notably, the pasture/range/paddock system has minimal emissions, recorded at 0%.

Indirect N2O

The indirect emissions of N2O gas occur when nitrogen from manure is converted to N2O in the environment, primarily due to microbial processes in soil and water. This conversion can be influenced by various factors including the type of manure management system employed, environmental conditions, and the handling and application of manure.

The Tier 1 method and standard IPCC default values were used to calculate Indirect N2O emissions, as Vanuatu lacks specific parameter values.

The primary manure management system contributing to emissions is the dry lot, accounting for 40% of total emissions due to its high cattle population. Additionally, 35% of emissions arise from uncovered anaerobic lagoons. In contrast, solid storage and liquid slurry systems produce lower emissions, contributing only 14% and 11%, respectively, as shown in Figure 10.

Table 5.1: Agriculture Sector Indirect N2O (Gg CO_2 eq) Emissions from Different Manure Management systems: 1990 - 1999

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Solid Storage Indirect N2O (Gg CO2 -e)	0.40679	0.40854	0.40766	0.40854	0.40854	0.40854	0.414879	0.41488	0.4221	0.422972958
Dry Lot Indirect N2O (Gg CO2 -e)	1.31551	1.35470	1.43308	1.51146	1.51930	1.51930	1.524894	1.52489	1.53049	1.530489371
Liquid/Slurry Indirect N2O (Gg CO2 -e)	0.33424	0.33424	0.33424	0.3342444	0.33424	0.33424	0.339815	0.33982	0.34539	0.34538593
Uncovered Unaerobic Lagoon Indirect N2O (Gg CO2 -e)	1.07436	1.07436	1.07436	1.0743572	1.07436	1.07436	1.092263	1.09226	1.11017	1.110169061
Indirect N2O (Gg CO2-e) Emissions from volatilisation	3.13089	3.17184	3.24934	3.3285989	3.33644	3.33644	3.371851	3.37185	3.4081	3.4090

Table 5.2: Agriculture Sector Indirect N2O (Gg CO_2 eq) Emissions from Different Manure Management systems: 2000 – 2009

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Solid Storage Indirect N2O (Gg CO2 -e)	0.44834	0.461023	0.48639	0.507167	0.527945	0.54238	0.558942	0.615037	0.634851	0.6345
Dry Lot Indirect N2O (Gg CO2 -e)	1.46665	1.399462	1.421844	1.477822	1.518123	1.544991	1.581447	1.86121	1.869687	1.752114
Liquid/Slurry Indirect N2O (Gg CO2 -e)	0.36767	0.37881	0.401093	0.417806	0.434518	0.445659	0.459207	0.494091	0.495796	0.495796
Uncovered Unaerobic Lagoon Indirect N2O (Gg CO2 -e)	1.18179	1.217605	1.289229	1.342946	1.396664	1.432476	1.476023	1.588151	1.59363	1.59363
Indirect N2O (Gg CO2-e) Emissions from volatilisation from Manure Management	3.46445	3.4569	3.598556	3.745741	3.87725	3.965506	4.07562	4.558489	4.593963	4.47604

Table 5.3: Agriculture Sector Indirect N2O (Gg CO_2 eq) Emissions from Different Manure Management systems: 2010 - 2022

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Solid Storage Indirect N2O (Gg CO2 -e)	0.62332	0.644764	0.651106	0.661828	0.656484	0.640685	0.611465	0.596595	0.584112	0.576906	0.565386	0.5539	0.536808
Dry Lot Indirect N2O (Gg CO2 -e)	1.7969	1.847283	1.868555	1.881988	1.897665	1.709853	1.405336	1.270102	1.26965	1.26888	1.265483	1.263627	1.255447
Liquid/Slurry Indirect N2O (Gg CO2 -e)	0.50137	0.512508	0.518079	0.52365	0.52365	0.513004	0.497495	0.484125	0.471697	0.466522	0.457865	0.449314	0.439687
Uncovered Unaerobic Lagoon Indirect N2O (Gg CO2 -e)	1.61154	1.647348	1.665254	1.68316	1.68316	1.648941	1.599091	1.556117	1.516169	1.499534	1.471708	1.444223	1.413281
Indirect N2O (Gg CO2-e) Emissions from volatilisation from Manure Management	4.53312	4.651902	4.702993	4.750626	4.760957	4.512483	4.113388	3.906939	3.841627	3.811842	3.760442	3.711063	3.645224

Figure 10: Indirect N_2O Emissions from the different type of manure management system: 1990 - 2022

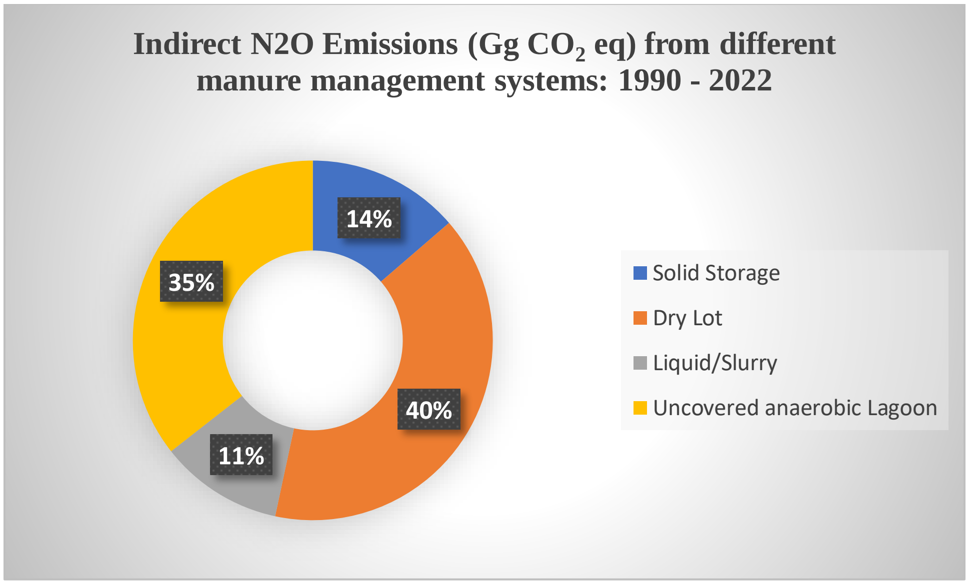


Figure 10 shows that the Dry Lot manure management system is the largest contributor to indirect N2O emissions at 40%. The uncovered anaerobic lagoon follows with 14%, while solid storage and liquid slurry contribute 11% and 14%, respectively.