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Enabling Activities for Preparation of Syria's Initial National Communication to UNFCCC

Green House Gases (GHG) Inventory for Agriculture and Forest Sector

July 2009

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Ministry of State for Environment Affairs (MSEA), in collaboration with United Nation Development Programm (UNDP) in Syria, and Global Environmental Facility (GEF).

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Green House Gas Emissions from Agriculture, Land use, Land use Change and Forestry (ALULUCF)in Syria Arab Republic

(INC-SY_GHG_ ALULUCF Inventory-En)

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This report has been approved unanimously by the technical committee, during the Technical Workshop which took place on 23th July 2009, in the Resort of Mount Hermon, Qunitra.

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Summary

1. Introduction

The Syrian Arab Republic lies on the eastern coast of the Mediterranean Sea, bounded by Turkey, Iraq, Palestine, Jordan, and Lebanon.

The total area of Syrian Arab Republic is: 18,517,971 hectares:

- 6 million hectares are cultivated land
- The remained is desert and rocky mountains.

Geographically: Syria may be divided into four regions:

1) The coastal region
2) The mountainous region
3) The interior region
4) The desert

The climate of the Mediterranean prevails in Syria, this climate may be characterized by a rainy winter and hot summer separated by two short transitional seasons. Syria may be divided into five agricultural zones:

- First zone: with annual rainfall over 350 mm/year. It is possible to get 2-3 successful yield crops every three years.
- Second zone: with annual rainfall rate between (250-350 mm/year) and less than 250 mm during two thirds of the related years. It is possible to get two successful barley yield every three years.
- Third zone: with annual rainfall rate over 250 mm and not less than this during the half of the relative years. It is possible to get 1-2 yields every three years.
- Fourth zone: with annual rainfall ranging between 200-250 mm/year and not less than 200 mm during half of the related years.
- Fifth zone: it covers what remains of the country, and not suitable for Farming.

2. Results

2.1. CH_4 Emissions from Agriculture Sector

Total CH_4 emissions from agriculture sector: it is arise from 107.49 kilo ton/year in 1994 to 168.23 kilo ton /year in 2005.

- ✓ From Rice: there is no emission.
- ✓ From Savanna Burning: it is about 1.72 kilo ton/ year in the period of 1994-2005.
- ✓ From Crops Burning: it is arise from 11.69 kilo ton/year in 1994 to14.50 kilo ton /year in 2005.
- ✓ From Domestic Livestock: it is arise from 94.08 kilo ton/year in 1994 to 165.01 kilo ton /year in 2005.

2.2.N_2O Emissions from Agriculture Sector

Total N_2O emissions from the agricultural sector: it changed from 23.64 kilo ton/year in 1994 to 33.96 kilo ton /year in 2005 .

- ✓ From Rice: there is no emission.
- ✓ From Savanna Burning: it is about 0.02 kilo ton/ year in the period of 1994-2005.
- ✓ From Crops Burning: it is change from 0.12 kilo ton/year in 1994 to 0.14 kilo ton/year in 2005.
- ✓ From Domestic Livestock: it is changed from 0.05 kilo ton/year in 1994 to 0.07 kilo ton /year in 2005.
- ✓ From Agricultural Soils: it is changed from 23.45 kilo ton/year in 1994 to 33.72 kilo ton /year in 2005.

2.3.CH_4 Emissions from Burning Forests: it is changed from 13.2-13.62 kilo ton/year in the period of 1994-2005

2.4. N_2O Emissions from Burning Forests: it was about 0.09 kilo ton/year in the period of (1994-2005).

2.5. Total CH_4 emissions from Agriculture and Forest and Land Management: it is changed from 122.3 kilo ton/year in 1994 to 183.22 kilo ton/year in 2005.in the period (1994-2005).

2.6. Total N_2O Emissions from Agriculture and Forest and Land Management: it is changed from 28.96 kilo ton/year in 1994 to 34.06 kilo ton/year in 2005. in the period (1994-2005).

2.7. Total CO_2 Emissions (equivalent to CH_4, N_2O) from Agriculture and Forest: was about 9779.25 kilo ton in 1994 and 14402.59 kilo ton/year in 2005

with:

1 molecules of N_2O equal 310 molecules of CO_2

1 molecule of CH_4 equals 21 molecules of CO_2

2.8. CO_2 Emissions from Forests:

- ✓ Forest and grassland conversions: CO_2 emissions changed from 15616.06 kilo ton in 1994 to 15639.16 kilo ton in 2005.
- ✓ From non arable lands: CO_2 emissions changed from 3879.33kilo ton in 1994 to 3620.83 kilo ton in 2005.
- ✓ Changes in soil carbon for mineral soils: CO_2emissions changed from 19489.65 kilo ton in 1994 to 19489.85 kilo ton in 2005.
- ✓ Changes in forest and other woody biomass stocks: CO_2emissions changed from 60037.62 kilo ton in 1994 to 81659 kilo ton in 2005.

1. General Information

1.1. Location, Area and Borders

Syria is located at the eastern coast of the Mediterranean Sea. The total area of Syria is 185180 Km^2 containing deserts, planes and mountains. The following neighboring countries border Syria:

- From the north: Turkey,
- From the east and southeast: Iraq,
- From the south: Jordan and Palestine,
- From the west: Lebanon and the Mediterranean

1.2. Climate

The Syrian Arab Republic enjoys a Mediterranean climate. A cold and rainy winter and a hot and dry summer characterize this type of climate. The two main seasons are separated by relatively two short transitional seasons: the spring and the autumn.

During winter, temperature is moderate to cold, and frost can be formed in mountains during the night. Rainfall ranges between 100 to 1400 mm/year. In summer the temperature rises to more than 30°c and can be more than 40°c sometimes. This weather is very dry with a high level of evaporation. In winter, weather is under the influence of two anticyclones which their centers are located in Siberia for the first one and in the Mediterranean Sea for the second one. While in summer Syria is under the influence of a depression coming from the Arabian Gulf, the Red Sea and North Africa.

Weather in Syria can be divided into five climate regions:

- ✓ A humid region: Its rain level is over 800 mm/year and more than 1200 to 1400 mm/year in the heights especially in coastal mountains which are covered by forests, fruit trees and vegetables.
- ✓ A semi-humid region: its rain level ranges between 500 and 800 mm/year. This region gathers coastal planes, hills and mountain bottoms. Fruit trees and moors are wide spread.
- ✓ A semi-dry region: its rain level ranges between 250-500 mm/year. This region is located between planes and some mountainous formations. Crop fields and fruit trees are well widespread in this region.
- ✓ A dry region: its rain level ranges between 200-250 mm/year. This region is mostly formed of planes. These planes are used as crop fields in irrigated regions and as barley fields in rainy region.
- ✓ A very dry region (the Syrian Desert): The annual level of rain is between 100-200 mm/year. This region constitutes the Syrian Desert where dry foliages and shrubs are the main plants. Its territories are not suitable for agriculture unless it is irrigated.
- ✓

Table (1) Land Use 1994-2006(1.2.3.4)

(Thousand Ha.)

Years	Cultivable Lands							Uncultivated Lands				Steppe and Pastures	Forests	Total Area
	Cultivated Lands					Uncultivated	Total	Building and Public Roads	Marshes & Lakes	Other Rocky &Sandy Lands	Total			
	Under Crops Lands			Fallow	Total									
	irrigated	Non-irrigated	Total											
1994	1082	3770	4852	635	5487	484	5971	606	138	3017	3761	8299	487	18518
1995	1089	3893	1982	520	5502	477	5979	611	139	3009	3759	8278	493	18518
1996	1126	3516	4642	828	5470	478	5948	612	137	2991	3740	8320	510	18518
1997	1168	3636	4804	718	5522	465	5987	611	138	2978	3727	8283	521	18518
1998	1213	3655	4868	616	5484	497	5981	619	148	2963	3730	8270	537	18518
1999	1200	3600	4800	600	5400	450	5850	619	143	2947	3710	8265	546	18518
2000	1210	3336	4546	806	5352	563	5905	617	147	2933	3697	8350	557	18518
2001	1267	3282	4549	901	5450	538	5988	619	148	2923	3690	8273	567	18518
2002	1333	3358	4591	830	5421	490	5911	628	149	2917	3694	8338	575	18518
2003	1361	3300	4661	817	5478	385	5863	636	159	2953	3730	8335	590	18518
2004	1439	3290	4729	798	5525	385	5910	651	161	2924	3935	8279	593	18518
2005														
2006	1450	3350	4800	788	5588	362	5950	658	154	2865	3677	8290	601	18518

Table (2) Area of Cultivated Lands by Agricultural Stabilization Zone, 1998(Thousand Ha.)

Mohafazat	First Zone		Second Zone		Third Zone		Fourth Zone		Fifth Zone	
	irrigated	Non-irrigated	irrigated	Non-irrigated	irrigated	Non-irrigated	irrigated	Non-irrigated	irrigated	Non-irrigated
Damascus	12	10	7	7	21	12	11	11	32	4
Aleppo	24	238	70	70	509	159	31	43	9	-
Homs	25	65	90	9	68	59	1	51	8	4
Hama	105	57	17	17	119	51	6	24	0	4
Lattakia	34	67	-	-	-	-	-	-	-	-
Dier Alzor	-	-	-	-	-	-	4	32	102	-
Idleb	30	192	3	4	80	30	-	-	-	-
Al-Hassakeh	140	313	184	184	219	130	26	186	29	-
Al- Rakka	-	-	37	37	128	133	38	191	57	6
Al-swieda	0	19	0	0	111	14	0	0	0	0
Dar'a	8	30	15	15	115	30	0	7	0	0
Tartous	25	94	-	-	-	-	-	-	-	-
Quneitra	4	18	-	-	-	-	-	-	-	-
Euphrat Basin	-	-	-	-	-	-	11	1	4	-
Total	407	1103	1103	343	1370	618	128	546	241	18

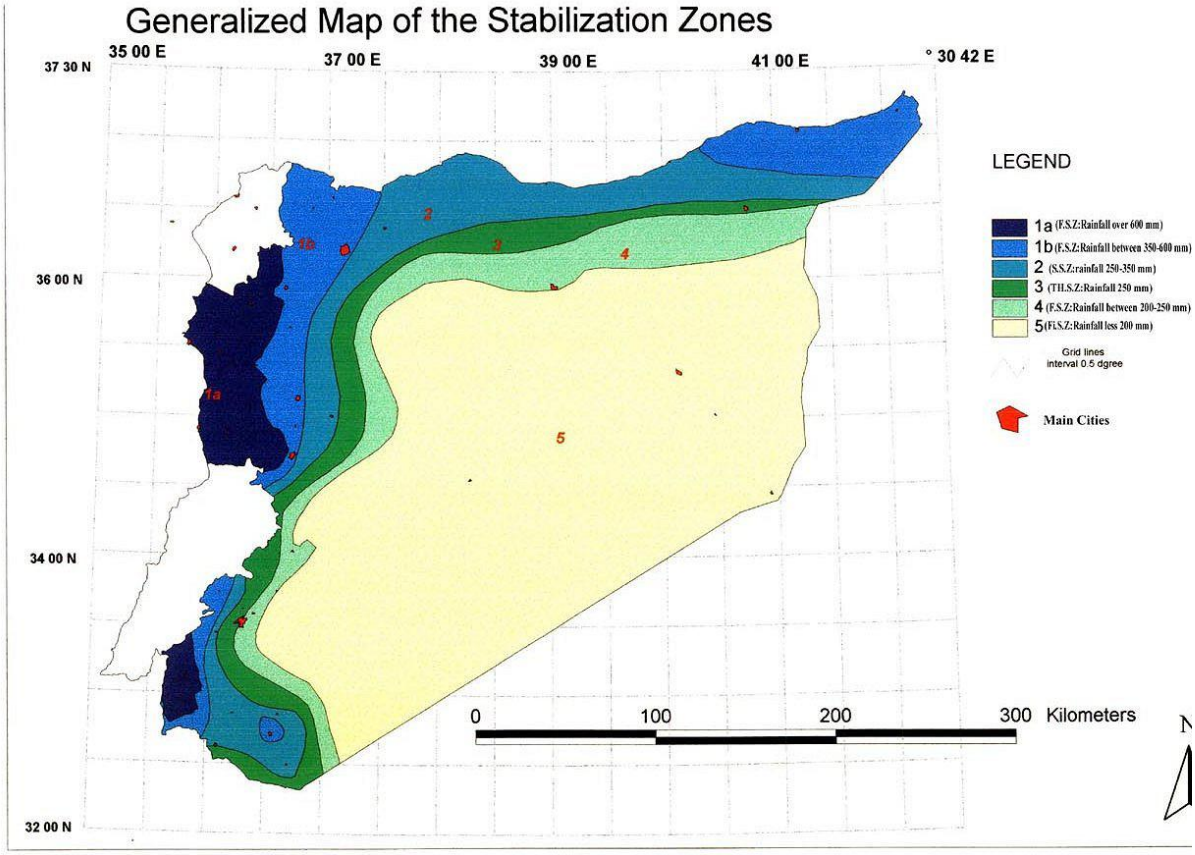

Fig (1) Map of Land use and the Stabilization Zones in Syria.

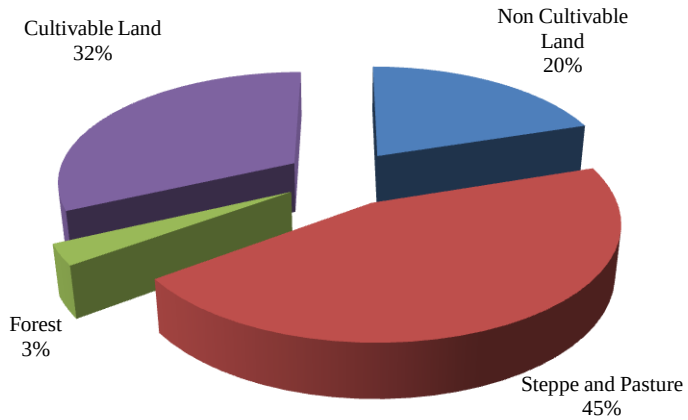

Fig (2) Land use in Syria 2004

2. Agricultural Sectors:

2.1. Animal Resources:

Table (3) shows the development of animal production in 1990 – 2006[1,2,3,4]

Table (3): Development of Animal Production in 1990 – 2006
Number of Animal × 1000

Year	Dairy cows	Non dairy cows	Cheep	Goats	Camels	Mules and Donkeys	Horses	Poultry	buffalos
1990	338	448	14571	991	4	195	41	13240	1
1994	320	405	11160	1028	6.2	214	27	18115	1
1995	367	408	12075	1063	6.7	217	27.2	18753	1.25
1996	375	435	13119	1082	7.1	209	28.2	19812	1.44
1997	390	468	13829	1100	7.5	210	27.5	19925	1.7
1998	448	484	15425	1101	8.9	244	25.6	20422	1.3
1999	465	515	13999	1046	13.3	233	26.6	21009	2.8
2000	469	515	13505	1050	13.4	229	27.1	21629	2.8
2001	416	421	12362	979	12.2	177	18.4	21122	2.5
2002	452	415	13497	932	12.5	137	16.8	28634	2.8
2003	459	478	15293	1017	15.2	133	16.3	25058	3.5
2004	528	496	17465	1131	20.4	128	15.3	28861	4
2005	561	517	19651	1295	23.4	123	16	23795	4
2006	597	524	21380	1420	28.7	118	14	30946	4

2.2. Burning of Savanna [1,2,3,4]

Table (4) Annual Burned Area of Savanna 1994-2006

Year	Area (th. Ha)	Yearly burned area (5%) (th. Ha)
1990	7849	392
1994	8299	415
1995	8289	414
1996	8320	416
1997	8283	414
1998	8270	414
1999	8255	413
2000	8307	415
2001	8273	414
2002	8338	417
2003	8335	417
2004	8279	414
2005	8333	417
2006	8290	415

2.3. Burning of Agricultural Residues

Table (5) shows the important agricultural residues and their quantities in 1990-2006[1,2,3,4]

Table (5) Annual Quantities of Agricultural Residues 1994 -2006

Year	Wheat	Barley	Cotton	Sugar beet	Tobacco	Corn	Potato	Tomatoes
1990	2070	846	441	421	13	180	398	430
1994	3702	1481	535	1448	23	203	553	491
1995	4184	1765	600	1466	23	199	471	427
1996	4080	1653	760	974	22	250	439	409
1997	3812	983	1037	1126	23	363	266	407
1998	4112	869	1017	1292	23	285	492	359
1999	2629	426	976	1330	25	181	499	359
2000	3105	212	1081	1175	26	190	485	329
2001	4747	1956	1010	1215	29	216	452	474
2002	4775	920	802	1523	26	232	513	425
2003	4918	1079	811	1205	26	227	457	562
2004	4537	527	1029	1218	26	210	542	559
2005	4667	767	1022	1098	29	194	606	946
2006	4932	1202	656	1438	25	163	603	1036

2.4. Agricultural Lands:

Table (6) shows the Area, production &yield of Crops and chemical fertilizer amount used In the period (1994-2006)[1,2,3,4]

Table (6) Area, Production &Yield of Crops and Chemical Fertilizer Amount Used In the Period (1994-2006)[1,2,3,4]

Year	Cereal		Industrial crops		vegetables		Legumes		Pastoral crops		Total air nitrogen fixing product	Total air nitrogen unfixing product	The (N) amount in the chemical fertilizing
	Area (th. ha)	Product (k. tons)	Area (th. ha)	Product (k. tons)	Area (th. ha)	Product (k. tons)	(Area (th. ha)	Product (k. tons)	Area (th. ha)	Product (k. tons)			
1994	3519	5493	288	2040	149	2501	259	605	67	645	605	10679	223
1995	3681	6093	306	2061	143	2295	300	690	59	660	690	11109	218
1996	3251	5989	305	1791	137	2133	291	676	66	639	676	10552	239
1997	3414	4321	341	2217	122	1836	304	538	42	514	538	8888	227
1998	3337	5270	361	2275	134	2448	354	625	50	521	625	10514	237
1999													218
2000	3057	3500	361	2316	108	2167	304	527	63	588	527	8581	251
2001	3056	6919	360	2302	117	2178	351	699	28	386	699	11785	160
2002	2974	5930	405	2476	134	2885	322	604	40	482	604	11773	195
2003	3117	6223	304	2116	133	3084	323	586	40	486	586	11909	241
2004	3192	5338	359	2080	151	3485	297	505	41	668	505	11611	226
2005	3287	5625	330	2204	154	3341	321	664	38	533	664	11703	266
2006	3145	6298	341	2209	139	3245	299	577	49	736	577	12488	267

3. Forests and Land Use Sectors:

3.1. The Natural Forests in Syria:

Syria is a very poor country in natural forests. There have been great efforts to maintain this sector by establishing the forestry nurses and encouraging the increase of the number of planted trees, particularly in areas that have been covered by natural forests.

The natural forests are concentrated in Lattakia governorate (about 31% of total area) and the other area is spread on the other governorate in a ratio of 0.2-18%.

3.2. Forest Products and Artificial Forest Area:

Table (7) Forest Products and Artificial Forest Area 1994 -2006

Year	Artificial Forestry Area	Industrial wood (ton)	Fire wood (ton)	Wooden charcoal (ton)	Woody plants (thousand splants)
1990	22900	29000	9000	2700	
1994	24177	27769	9860	2770	30791
1995	22576	12608.5	4402.5	3773.3	30817
1996	27026	19357	2541	3400	30331
1997	24870	27493.5	7754.5	3931	30367
1998	25998	18282	16202	4344	31211
1999	22329	28175	8597	4250	34559
2000	22798	33749	8551	3355	37768
2001	25913	27957	7179.6	3094	26756
2002	19053	32001	7579	2878	22998
2003	16781	37754	9100	6090	21918
2004	11850	51441	12668	6869	20976
2005	11928	46133	12567	8836	18925
2006	10471	48450	13702	8524	20720

Table (8) Forest Area 1990 -2006

Year	Forests	Natural forests							Artificial forests		
	Total	Seed vascular plants (25%)			Wide leafs (75%)			Total	Seed vascular plants (25%)	Wide leafs (75%)	Total
		Ogy (25%)	Maki (50%)	Retrograde (25%)	Ogy (25%)	Maki (50%)	Retrograde (25%)				
1990	377	14.5	29	14.5	43.75	87.5	43.75	233	36	44	144
1994	386	14.5	29	14.5	43.75	87.5	43.75	233	38.25	114.75	153
1995	399	14.5	29	14.5	43.75	87.5	43.75	233	41.5	124.5	166
1996	412	14.5	29	14.5	43.75	87.5	43.75	233	44.75	134.25	179
1997	429	14.5	29	14.5	43.75	87.5	43.75	233	49	147	196
1998	442	14.5	29	14.5	43.75	87.5	43.75	233	52.25	156.75	209
1999	451	14.5	29	14.5	43.75	87.5	43.75	233	54.5	163.5	218
2000	461	14.5	29	14.5	43.75	87.5	43.75	233	57	171	228
2001	472	14.5	29	14.5	43.75	87.5	43.75	233	59.75	179.25	239
2002	478	14.5	29	14.5	43.75	87.5	43.75	233	61.25	183.75	245
2003	486	14.5	29	14.5	43.75	87.5	43.75	233	63.25	189.75	253
2004	491	14.5	29	14.5	43.75	87.5	43.75	233	64.5	193.5	258
2005	505	14.5	29	14.5	43.75	87.7	43.75	233	68	204	272
2006	515	14.5	29	14.5	43.75	87.5	43.75	233	70.5	121.5	282

Table (9) Recorded, Actual and Abandonment Areas in 1990 - 2006

Year	Recorded area (forest) (thousand Hectares)	Actual forest area (thousand Hectares)			Abandonment area (thousand Hectares)
		Natural	Artificial	Total	
1990	723	233	144	377	346
1994	487	233	153	386	101
1995	493	233	166	399	94
1996	510	233	179	412	98
1997	522	233	196	429	93
1998	537	233	209	442	95
1999	546	233	218	451	95
2000	557	233	228	461	96
2001	566	233	239	472	103
2002	575	233	245	478	97
2003	590	233	253	486	104
2004	593	233	258	491	102
2005	575	233	272	505	70
2006	601	233	282	515	86

Table (10) Number of Fruit Trees (1990-2006)

year	Total fruit trees (thousand trees)	productive trees (thousand trees)	Non productive trees (thousand trees)
1994	156567	99210	57357
1995	170440	112626	57814
1996	185430	117795	67635
1997	185402	125646	59756
1998	191596	130395	61201
1999	198235	132251	65984
2000	195713	134107	61606
2001	197167	136107	61060
2002	182988	134675	48313
2003	182387	135145	47242
2004	198085	141456	56629
2005	206271	141835	64436
2006	201335	144784	56551

Table (11) Reformed Areas of Fruit Afforestation Projects

Year	Total
1995	28389
1996	31667
1997	29873
1998	29750
1999	27161
2000	24862
2001	24370
2002	149957
2003	22595
2004	28179

4. Basic and non basic sectors

4.1. Basic Sector:

- All Human emotions in forest and agriculture sectors except fuel burning and waste emotions
- Ruminants which have carbohydrate fermentation in their guts release methane gas
- Enteric fermentation
- Agricultural soil and organic compounds from crops
- Organic and non organic fertilizers
- seed burning
- crop wastes burning (not for generating power)
- forest management
- change in forest and lands uses

4.2. Non Basic Sector:

- rice cultivation (there is no rice cultivation)

5. GHG Calculation from Agriculture, Forest and Land use 5 (1994)

(according to IPCC1996 (Tier 1)

5.1. Agricultural Sector

5.1.1. Ch_4 and N_2O Calculation from Animals and their Wastes:

MODULE	AGRICULTURE					
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT					
WORKSHEET	4-1					
SHEET	1 OF 2 METHANE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT					
COUNTRY	Syria					
YEAR	1994					
	STEP 1		STEP 2			STEP 3
	A	B	C	D	E	F
Livestock Type	Number of Animals	Emissions Factor for Enteric Fermentation	Emissions from Enteric Fermentation	Emissions Factor for Manure Management	Emissions from Manure Management	Total Annual Emissions from Domestic Livestock
		(kg/head/yr)	(t/yr)	(kg/head/yr)	(t/yr)	(Gg)
			C=(AxB)/1000		E=(AxD)/1000	F=(C+E)/1000
Dairy Cattle	320000	36	11,520.00	2	640.00	12.16
Non-dairy Cattle	405000	32	12,960.00	1	405.00	13.37
Buffalo	1000	55	55.00	5	5.00	0.06
Sheep	11160000	5	55,800.00	0.16	1,785.60	57.59
Goats	1028000	5	5,140.00	0.17	174.76	5.31
Camels	6000	46	276.00	1.9	11.40	0.29
Horses	27000	18	486.00	1.6	43.20	0.53
Mules & Asses	214000	10	2,140.00	0.9	192.60	2.33
Swine	0	0	0.00	3	0.00	0.00
Poultry	18110000	0.117	2,118.87	0.018	325.98	2.44
Totals			90,495.87		3,583.54	94.08

Calculation Methods:

- From entric fermation of animal:

C = (A x B)/1000

Where :
C= is quantity of CH_4 from enteric fermentation of a single kind of animals (kt)
A = the total number of this kind of animal;
B = is CH_4 emission factor for this kind of animal (in Kg/head/year);
ΣC is the sum of CH_4 emissions due to enteric fermentation from all kinds of animals.

- Management of Animal Wastes

E = (A x D)/1000

Where:
E= is quantity of CH_4 from waste management of a single kind of animals
A= the total number of this kind of animal;
D= is the emission factor for this kind of animal (in Kg/head/year);
Σ E= is the sum of CH_4 emissions due to waste management for all kinds of animals.

- Total CH_4 : **$Q = \Sigma C + \Sigma E$**

5.1.2. N_2O Calculation from Animals and their Waste

- From animal waste management systems

D = (A x B x C)

Where:

D= total Nitrogen emission from animal manure management systems

A= number of animals[1,2,3,4]

B= Nitrogen factor Nex for each type of animals (Kg/Head/Year)[5]

C= nitrogen fertilizer factor in animal manure management system (according to the system type)[5]

MODULE	AGRICULTURE			
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT			
WORKSHEET	4-1 (SUPPLEMENTAL)			
SPECIFY AWMS	ANAEROBIC LAGOONS			
SHEET	NITROGEN EXCRETION FOR ANIMAL WASTE MANAGEMENT SYSTEM			
COUNTRY	**SYRIA**			
YEAR	**1994**			
	A	B	C	D
Livestock Type	Number of Animals	Nitrogen Excretion Nex	Fraction of Manure Nitrogen per AWMS (%/100)	Nitrogen Excretion per AWMS, Nex
		(kg//head/(yr)	(fraction)	(kg N/yr)
				D = (A x B x C)
Non-dairy Cattle	405000	50	0	0.00
Dairy Cattle	320000	70	0	0.00
Poultry	18110000	0.6	0	0.00
Sheep	11160000	12	0	0.00
Swine	0	16	0	0.00
Others	1028000	40	0	0.00
			TOTAL	0.00

MODULE	AGRICULTURE			
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT			
WORKSHEET	4-1(SUPPLEMENTAL)			
SPECIFY AWMS	LIQUID SYSTEMS			
SHEET	NITROGEN EXCRETION FOR ANIMAL WASTE MANAGEMENT SYSTEM			
COUNTRY	**SYRIA**			
YEAR	**1994**			
Livestock Type	A	B	C	D
	Number of Animals	Nitrogen Excretion Nex (kg//head/(yr)	Fraction of Manure Nitrogen per AWMS (%/100) (fraction)	Nitrogen Excretion per AWMS, Nex (kg N/yr)
				D=(AxBxC)
Non-dairy Cattle	405000	50	0	0.00
Dairy Cattle	320000	70	0	0.00
Poultry	18110000	0.6	0.01	108,660.00
Sheep	11160000	12	0	0.00
Swine	0	16	0.32	0.00
Others	1028000	40	0	0.00
			TOTAL	108,660.00

SUBMODULE	METHANE AN D NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT			
WORKSHEET	4-1 (SUPPLEMENTAL)			
SPECIFY AWMS	SOLID STORAGE AND DRYLOT			
SHEET	NITROGEN EXCRETION FOR ANIMAL WASTE MANAGEMENT SYSTEM			
COUNTRY	**SYRIA**			
YEAR	**1994**			
Livestock Type	A	B	C	D
	Number of Animals	Nitrogen Excretion Nex (kg//head/(yr)	Fraction of Manure Nitrogen per AWMS (%/100) (fraction)	Nitrogen Excretion per AWMS, Nex (kg N/yr)
				D=(AxBxC)
Non-dairy Cattle	405000	50	0	0.00
Dairy Cattle	320000	70	0.03	672,000.00
Poultry	18110000	0.6	0	0.00
Sheep	11160000	12	0	0.00
Swine	0	16	0.68	0.00
Others	1028000	40	0	0.00
			TOTAL	**672,000.00**

MODULE	AGRICULTURE			
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT			
WORKSHEET	4-1 (SUPPLEMENTAL)			
SPECIFY AWMS	DAILY SPREAD			
SHEET	NITROGEN EXCRETION FOR ANIMAL WASTE MANAGEMENT SYSTEM			
COUNTRY	**SYRIA**			
YEAR	**1994**			
Livestock Type	A	B	C	D
	Number of Animals	Nitrogen Excretion Nex (kg//head/(yr)	Fraction of Manure Nitrogen per AWMS (%/100) (fraction)	Nitrogen Excretion per AWMS, Nex (kg N/yr)
				D=(AxBxC)
Non-dairy Cattle	405000	50	0.02	405,000.00
Dairy Cattle	320000	70	0.03	672,000.00
Poultry	18110000	0.6	0	0.00
Sheep	11160000	12	0	0.00
Swine	0	16	0	0.00
Others	1028000	40	0	0.00
			TOTAL	**1,077,000.00**

MODULE	AGRICULTURE			
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT			
WORKSHEET	4-1 (SUPPLEMENTAL)			
SPECIFY AWMS	PASTURE RANGE AND PADDOCK			
SHEET	NITROGEN EXCRETION FOR ANIMAL WASTE MANAGEMENT SYSTEM			
COUNTRY	**SYRIA**			
YEAR	**1994**			
Livestock Type	A	B	C	D
	Number of Animals	Nitrogen Excretion Nex (kg//head/(yr)	Fraction of Manure Nitrogen per AWMS (%/100) (fraction)	Nitrogen Excretion per AWMS, Nex (kg N/yr)
				D=(AxBxC)
Non-dairy Cattle	405000	50	0.77	15,592,500.00
Dairy Cattle	320000	70	0.77	17,248,000.00
Poultry	18110000	0.6	0.71	7,714,860.00
Sheep	11160000	12	1	133,920,000.00
Swine	0	16	0	0.00
Others	1028000	40	1	41,120,000.00
			TOTAL	**215,595,360.00**

MODULE	AGRICULTURE			
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT			
WORKSHEET	4-1 (SUPPLEMENTAL)			
SPECIFY AWMS	OTHER			
SHEET	NITROGEN EXCRETION FOR ANIMAL WASTE MANAGEMENT SYSTEM			
COUNTRY	**SYRIA**			
YEAR	**1994**			
Livestock Type	A	B	C	D
	Number of Animals	Nitrogen Excretion Nex (kg//head/(yr)	Fraction of Manure Nitrogen per AWMS (%/100) (fraction)	Nitrogen Excretion per AWMS, Nex (kg N/yr)
				D=(AxBxC)
Non-dairy Cattle	405000	50	0.02	405,000.00
Dairy Cattle	320000	70	0	0.00
Poultry	18110000	0.6	0.28	3,042,480.00
Sheep	11160000	12	0	0.00
Swine	0	16	0	0.00
Others	1028000	40	0	0.00
			TOTAL	**3,447,480.00**

5.1.3. N_2O Emissions Calculation from Animals Production

MODULE	AGRICULTURE		
SUBMODULE	METHANE AND NITROUS OXIDE EMISSIONS FROM DOMESTIC LIVESTOCK ENTERIC FERMENTATION AND MANURE MANAGEMENT		
WORKSHEET	4-1		
SHEET	2 OF 2 NITROUS OXIDE EMISSIONS FROM ANIMAL PRODUCTION EMISSIONS FROM ANIMAL WASTE MANAGEMENT SYSTEMS (AWMS)		
COUNTRY	**SYRIA**		
YEAR	**1994**		
STEP 4			
Animal Waste Management System (AWMS)	A	B	C
	Nitrogen Excretion Nex(AWMS) (kg N/yr)	Emission Factor For AWMS EF3 (kg N2O–N/kg N)	Total Annual Emissions of N2O (Gg)
			C=(AxB)[44/28] / 1 000 000
Anaerobic lagoons	0.00	0.001	0.00
Liquid systems	108,660.00	0.001	0.00
Daily spread	1,077,000.00		
Solid storage & drylot	672,000.00	0.02	0.02
Pasture range and paddock	215,595,360.00		
Other	3,447,480.00	0.005	0.03
Total	**220,900,500.00**	**Total**	**0.05**

$$C=(A \times B)\ (44/28) / 1{,}000{,}000$$

Where:
C= total N2O emission
A= nitrogen emission from animal management
B= emission factor according to animal waste management system[5]

5.1.4. GHG Calculation from Savanna Burning

Burning about (5-10%) and it is calculated on 5%

MODULE	AGRICULTURE						
SUBMODULE	PRESCRIBED BURNING OF SAVANNAS						
WORKSHEET	4-3						
SHEET	1 OF 3						
COUNTRY	**SYRIA**						
YEAR	**1994**						
STEP 1					STEP 2		
A	B	C	D	E	F	G	H
Area Burned by Category (specify) (k ha)	Biomass Density of Savanna (t dm/ha)	Total Biomass Exposed to Burning (Gg dm)	Fraction Actually Burned	Quantity Actually Burned (Gg dm)	Fraction of Living Biomass Burned	Quantity of Living Biomass Burned (Gg dm)	Quantity of Dead Biomass Burned (Gg dm)
		C=(AxB)		E=(CxD)		G=(ExF)	H=(E-G)
415	2.4	996.00	0.85	846.60	0.45	380.97	
							465.63
		0.00		0.00		0.00	
							0.00

- Quantity Actually Burned

$$E = A \times D \times B$$

where:
E = Quantity Actually Burned (Ggdm)
A= Area Burned by Category (specify) (kha)[(3)]
B= Biomass Density of Savanna (tdm/ ha)
D = Fraction Actually Burned (0.85) [(5)]

- Quantity of Living Biomass Burned

$$G = E \times F$$

Where:
G = Quantity of Living Biomass Burned (Gg dm).
F = Fraction of Living Biomass Burned [(5)]

- Quantity of Dead Biomass Burned Gg dm

$$H = E - G$$

➢ Total Carbon Released (L) (Gg c)

MODULE	AGRICULTURE			
SUBMODULE	PRESCRIBED BURNING OF SAVANNAS			
WORKSHEET	4-3			
SHEET	2 OF 3			
COUNTRY	**SYRIA**			
YEAR	**1994**			
STEP 3				
	I	J	K	L
	Fraction Oxidised of living and dead biomass	Total Biomass Oxidised (Gg dm)	Carbon Fraction of Living & Dead Biomass	Total Carbon Released (Gg C)
		Living: J=(GxI) Dead: J=(HxI)		L = (J x K)
Living	0.8	304.78	0.45	137.15
Dead	1	465.63	0.4	186.25
Total				323.40

$$L = (G \times I1 \times K1) + (H \times I2 \times K2)$$

Where:
L= total carbon release (Gg c)
I1= Fraction Oxidized of living biomass (0.80)[5]
I2 Fraction Oxidized of dead biomass (1) [5]
K1= Carbon Fraction of Living Biomass (0.45)[5]
K2= Carbon Fraction of Dead Biomass (0.4)[5]

5.1.5. Calculation of GHG (NO_x – N_2O - CO – CH_4)

MODULE	AGRICULTURE					
SUBMODULE	PRESCRIBED BURNING OF SAVANNAS					
WORKSHEET	4-3					
SHEET	3 OF 3					
COUNTRY	**SYRIA**					
YEAR	**1994**					
STEP 4					STEP 5	
L	M	N	O	P	Q	R
Total Carbon Released (Gg C)	Nitrogen-Carbon Ratio	Total Nitrogen Content (Gg N)	Emissions Ratio	Emissions (Gg C or Gg N)	Conversion Ratio	Emissions from Savanna Burning (Gg)
		N = (L x M)		P=(LxO)		R=(PxQ)
			0.004	1.29	16/12	CH4 1.72
			0.06	19.40	28/12	CO 45.28
323.40	0.006	1.94		P = (N x O)		R = (P x Q)
			0.007	0.01	44/28	N2O 0.02
			0.121	0.23	46/14	NOx 0.77

R1 = L x 0.004 x 16/12 CH_4 emission (Gg)
R2 = L x 0.06 x 28/12 CO emission (Gg)
R3 = L x 0.06 x 0.007 x 44/28 N_2O emission (Gg)
R4 = L x 0.06 x 0.121 x 46/14) Nox emission (Gg)

5.1.6. GHG Emissions Calculation from Field Burning of Agricultural Residues:

Calculation method

- Quantity of dry Residue (Gg): $E = A \times B \times D$

Where :
E= Quantity of dry Residue (Gg)
A= Annual Production (Gg crop)[1,2,3,4]
B= Residue to Crop Ratio
D = Dry Matter Fraction [5]

- Total Biomass burned (Ggdm): $H = E \times F \times G$

Where:
H = Total Biomass burned (Ggdm)
F = fraction burned in field
G= fraction oxidized

- Total carbon released (Ggc): $J = H \times I$

Where :I = Carbon fraction of Residue = 0.45 [5]

- Total nitrogen released (Ggc): $L = J \times K$

Where :
K nitrogen-carbon ratio = 0.006

- Emissions from Field Burning of Agricultural Residues ($NOx - N_2O$ - $CO - CH_4$):
  $CH_4 = J \times 0.005 \times 16/12$ (Gg)
  $CO = J \times 0.06 \times 28/12$(Gg)
  $N_2O = L \times 0.007 \times 44/28$ (Gg)
  $NOx = L \times 0.121 \times 46/14$ (Gg)

MODULE	AGRICULTURE							
SUBMODULE	FIELD BURNING OF AGRICULTURAL RESIDUES							
WORKSHEET	4-4							
SHEET	1 OF 3							
COUNTRY	**SYRIA**							
YEAR	**1994**							
	STEP 1			STEP 2		STEP 3		
Crops (specify locally important crops)	A	B	C	D	E	F	G	H
	Annual Production (Gg crop)	Residue to Crop Ratio	Quantity of esidue (Gg biomass)	Dry Matter Fraction	Quantity of Dry Residue (Gg dm)	Fraction Burned in Fields	Fraction Oxidised	Total Biomass Burned (Gg dm)
			C=(AxB)		E=(CxD)			H=(ExFxG)
WHEAT	3702	1.3	4,812.60	0.781	3,758.64	0.9	0.853	2,885.51
BARLEY	1481	1.2	1,777.20	0.781	1,387.99	0.9	0.457	570.88
CORN	203	1	203.00	0.3	60.90	0.9	0.457	25.05
SUGAR BEAT	1448	0.2	289.60	0.1	28.96	0.9	0.457	11.91
COTTON	535	1.3	695.50	0.781	543.19	0.9	0.823	402.34
TOBACO	23	0.2	4.60	0.3	1.38	0.9	0.407	0.51
Total:								**3,896.19**

MODULE	AGRICULTURE			
SUBMODULE	FIELD BURNING OF AGRICULTURAL RESIDUES			
WORKSHEET	4-4			
SHEET	2 OF 3			
COUNTRY	**SYRIA**			
YEAR	**1994**			
	STEP 4		**STEP 5**	
Crops	I	J	K	L
	Carbon Fraction of Residue	Total Carbon Released (Gg C)	Nitrogen Carbon Ratio	Total Nitrogen Released (Gg N)
		J=(HxI)		L=(JxK)
WHEAT	0.45	1,298.48	0.006	7.79
BARLEY	0.45	256.90	0.006	1.54
CORN	0.45	11.27	0.006	0.07
SUGAR BEAT	0.45	5.36	0.006	0.03
COTTON	0.45	181.05	0.006	1.09
TOBACO	0.45	0.23	0.006	0.00
Total:		**1,753.29**		**10.52**

MODULE	AGRICULTURE			
SUBMODULE	FIELD BURNING OF AGRICULTURAL RESIDUES			
WORKSHEET	4-4			
SHEET	3 OF 3			
COUNTRY	**SYRIA**			
YEAR	**1994**			
STEP 6				
	M	N	O	P
	Emission Ratio	Emissions (Gg C or Gg N)	Conversion Ratio	Emissions from Field Burning of Agricultural Residues (Gg)
		N = (J x M)		P = (N x O)
CH4	0.005	8.77	16/12	11.69
CO	0.06	105.20	28/12	245.46
		N = (L x M)		P = (N x O)
N2O	0.007	0.07	44/28	0.12
NOx	0.121	1.27	46/14	4.18

5.1.7. GHG Calculation from Agricultural Soils

$$O = G + C + N$$

Where:

G = Total direct emission of N2o

C = N2O emission from Grazing Animals

N = Total indirect N2O emission

SUBMODULE	AGRICULTURAL SOILS		
WORKSHEET	4-5		
SHEET	1 OF 5 DIRECT NITROUS OXIDE EMISSIONS FROM AGRICULTURAL FIELDS, EXCLUDING CULTIVATION OF HISTOSOLS		
COUNTRY	**SYRIA**		
YEAR	**1994**		
	STEP 1	STEP 2	
Type of N input to soil	A	B	C
	Amount of N Input (kg N/yr)	Factor for Direct Emissions EF1 (kg N2O–N/kg N)	Direct Soil Emissions (Gg N2O-N/yr)
			C = (A x B)/1 000 000
Synthetic fertiliser (FSN)	200,700,000.00	0.0125	2.51
Animal waste (FAW)	172,302,390.00	0.0125	2.15
N-fixing crops (FBN)	35343000	0.0125	0.44
Crop residue (FCR)	120,891,993.75	0.0125	1.51
		Total	**6.62**

MODULE	AGRICULTURE				
SUBMODULE	AGRICULTURAL SOILS				
WORKSHEET	4-5A (SUPPLEMENTAL)				
SHEET	1 OF 1 MANURE NITROGEN USED				
COUNTRY	**SYRIA**				
YEAR	**1994**				
A	B	C	D	E	F
Total Nitrogen Excretion (kg N/yr)	Fraction of Nitrogen Burned for Fuel (fraction)	Fraction of Nitrogen Excreted During Grazing (fraction)	Fraction of Nitrogen Excreted Emitted as NOX and NH3 (fraction)	Sum (fraction)	Manure Nitrogen Used (corrected for NOX and NH3 emissions), FAW (kg N/yr)
				F=1-(B+C+D)	F = (A x E)
220,900,500.00	**0**	**0.02**	**0.2**	**0.78**	**172,302,390.00**

MODULE	AGRICULTURE					
SUBMODULE	AGRICULTURAL SOILS					
WORKSHEET	4-5B (SUPPLEMENTAL)					
SHEET	1 OF 1 NITROGEN INPUT FROM CROP RESIDUES					
COUNTRY	**SYRIA**					
YEAR	**1994**					
A	B	C	D	E	F	G
Production of non - N - Fixing Crops (kg dry biomass/yr)	Fraction of Nitrogen of non - N - Fixing Crops, (kg N/kg dry biomass)	Production of Pulses and Soybeans (kg dry biomass/yr)	Fraction of Nitrogen in N-Fixing Crops, (kg N/kg dry biomass)	One minus the Fraction of Crop Residue Removed From Field (fraction)	One minus the Fraction of Crop Residue Burned (fraction)	Nitrogen Input from Crop Residues, FCR (kg N/yr)
						G =2x(AxB+CxD)x ExF
8590950000	**0.015**	**589050000**	**0.03**	**0.55**	**0.75**	**120,891,993.75**

MODULE	AGRICULTURE			
SUBMODULE	AGRICULTURAL SOILS			
WORKSHEET	4-5			
SHEET	2 OF 5 DIRECT NITROUS OXIDE EMISSIONS FROM CULTIVATION OF HISTOSOLS			
COUNTRY	**SYRIA**			
YEAR	**1994**			
	STEP 3			STEP 4
	D	E	F	G
	Area of Cultivated Organic Soils FOS (ha)	Emission Factor for Direct Soil Emissions EF2 (kg N2O–N/ha/yr)	Direct Emissions from Histosols (Gg N2O–N/yr)	Total Direct Emissions of N2O (Gg)
			F=(D x E)/1 000 000	G = (C+F)[44/28]
Subtotal	**0**	**5**	**0.00**	**10.40**

MODULE	AGRICULTURE		
SUBMODULE	AGRICULTURAL SOILS		
WORKSHEET	4-5		
SHEET	3 OF 5 NITROUS OXIDE SOIL EMISSIONS FROM GRAZING ANIMALS - PASTURE RANGE AND PADDOCK		
COUNTRY	**SYRIA**		
YEAR	**1994**		
	STEP 5		
	A	B	C
Animal Waste Management System (AWMS)	Nitrogen Excretion Nex(AWMS) (kg N/yr)	Emission Factor for AWMS EF3 (kg N2O–N/kg N)	Emissions Of N2O from Grazing Animals (Gg)
			C = (A x B)[44/28]/1,000,000
Pasture range & paddock	**215,595,360.00**	**0.02**	**6.78**

MODULE	AGRICULTURE							
SUBMODULE	AGRICULTURAL SOILS							
WORKSHEET	4-5							
SHEET	4 OF 5 INDIRECT NITROUS OXIDE EMISSIONS FROM ATMOSPHERIC DEPOSITION OF NH3 AND NOX							
COUNTRY	**SYRIA**							
YEAR	**1994**							
	STEP 6							
Type of Deposition	A	B	C	D	E	F	G	H
	Synthetic Fertiliser N Applied to Soil, NFERT (kg N/yr)	Fraction of Synthetic Fertiliser N Applied that Volatilizes FracGASFS (kg N/kg N)	Amount of Synthetic N Applied to Soil that Volatilizes (kg N/kg N)	Total N Excretion by Livestock NEX (kg N/yr)	Fraction of Total Manure N Excreted that Volatilizes FracGASM (kg N/kg N)	Total N Excretion by Livestock that Volatilizes (kg N/kg N)	Emission Factor EF4 (kg N2O–N/kg N)	Nitrous Oxide Emissions (Gg N2O–N/yr)
			C=(AxB)			F=(DxE)		H=(C+F)x G/1,000,000
Total	**223,000,000**	**0.1**	**22,300,000**	**220,900,500**	**0.2**	**44,180,100**	**0.01**	**0.66**

MODULE	AGRICULTURE						
SUBMODULE	AGRICULTURAL SOILS						
WORKSHEET	4-5						
SHEET	5 OF 5 INDIRECT NITROUS OXIDE EMISSIONS FROM LEACHING						
COUNTRY	**SYRIA**						
YEAR	**1994**						
	STEP 7					**STEP 8**	**STEP 9**
	I	J	K	L	M	N	O
	Synthetic Fertiliser Use NFERT (kg N/yr)	Livestock N Excretion NEX (kg N/yr)	Fraction of N That Leaches FracLEACH (kg N/kg N)	Emission Factor EF5	Nitrous Oxide Emissions From Leaching (Gg N2O–N/yr)	Total Indirect Nitrous Oxide Emissions (Gg N2O/yr)	Total Nitrous Oxide Emissions (Gg)
					M = (I + J) x K x L/1 000 000	N=(H+M)[44/28]	O = (G+C+N) (G from Worksheet 4-5, sheet 2, Step 4; C from Worksheet 4-5, sheet 3, Step 5; N from Worksheet 4-5, sheet 5, Step 8).
Total	**223,000,000.00**	**220,900,500.00**	**0.3**	**0.025**	**3.33**	**6.28**	**23.45**

5.2. GHG Emission from Forests and Land Use

calculation method (can be applied in result tables)

5.2.1. Changes in Forest and Other Woody Biomass Stocks

- Total Carbon Uptake Increment

$$E = A \times B \times D$$

Where:

A = forests area (1,2,3,4)

B = Annual Growth Rate

D = Carbon Fraction of Dry Matter = 0.9 (5)

- b- Total Biomass Consumption from Stocks

$$M = K - L$$

Where:

K= Total Biomass Consumption

L = Wood Removed From Forest Clearing

- c- Annual carbon release

$$O = (M \times N)$$

Where: N = Carbon fraction = 0.45

- d- Net annual carbon uptake (+) or release (-)

$$P = (E - O)$$

- e- convert to CO2 Annual Emission(+) or release(-)

$$Q = (P \times [44/12])$$

MODULE			**LAND USE CHANGE AND FORESTRY**				
SUBMODULE			**CHANGES IN FOREST AND OTHER WOODY BIOMASS STOCKS**				
WORKSHEET			**5-1**				
SHEET			**1 OF 3**				
COUNTRY			**SYRIA**				
YEAR			**1994**				
STEP 1							
			A Area of Forest/BiomassStocks (kha)	B Annual Growth Rate (t dm/ha)	C Annual Biomass Increment (kt dm)	D Carbon Fraction of Dry Matter	E Total Carbon Uptake Increment (kt C)
					C=(AxB)		E=(CxD)
Temperate	Plantations	Douglas fir	6	6	36.00	0.5	18.00
		Loblolly pine	18	4	72.00	0.5	36.00
	Commercial	Evergreen	81.75	220	17,985.00	0.5	8,992.50
		Deciduous	246	175	43,050.00	0.5	21,525.00
	Other		58.25	10	582.50	0.5	291.25
Non-Forest Trees (specify type)			A Number of Trees(1000s of trees)	B Annual Growth Rate (kt dm/1000 trees)			
fruitless tree (young tress)			57357	0.01	573.57	0.5	286.79
fruit trees (fertiles)			99210	0.02	1,984.20	0.5	992.10
						Total	**32,141.64**

MODULE	LAND USE CHANGE AND FORESTRY							
SUBMODULE	CHANGES IN FOREST AND OTHER WOODY BIOMASS STOCKS							
WORKSHEET	5-1							
SHEET	2 OF 3							
COUNTRY	SYRIA							
YEAR	1994							
	STEP 2							
	F	G	H	I	J	K	L	M
Harvest Categories (specify)	Commercial Harvest (if applicable) (1000 m^3 roundwood)	Biomass Conversion/ Expansion Ratio (if applicable) (t dm/m^3)	Total Biomass Removed in Commercial Harvest (kt dm)	Total Traditional Fuelwood consumed (kt dm)	Total Other Wood Use (kt dm)	Total Biomass Consumption (kt dm)	Wood Removed From Forest Clearing (kt dm)	Total Biomass Consumption From Stocks (kt dm)
			H = (F x G)	FAO data		K =(H+I+J)	(From column M, Worksheet 5-2, sheet 3)	M=K-L
			28.00	10	3	41.00		
			0.00			0.00		
			0.00			0.00		
Totals	0.00		28.00	10.00	3.00	41.00	2,020.13	-1,979.13

MODULE	LAND USE AND FORESTRY		
SUBMODULE	CHANGES IN FOREST AND OTHER WOODY BIOMASS STOCKS		
WORKSHEET	5-1		
SHEET	3 OF 3		
COUNTRY	SYRIA		
YEAR	1994		
STEP 3		STEP 4	
N	O	P	Q
Carbon Fraction	Annual Carbon Release (kt C)	Net Annual Carbon Uptake (+) or Release (-) (kt C)	Convert to CO_2 Annual Emission (-) or Removal (+) (Gg CO_2)
	O = (M x N)	P = (E - O)	Q=(P x [44/12])
0.45	**-890.61**	**33,032.24**	**121,118.22**

5.2.2. Forest and Grassland Conversion-CO_2 from Biomass

- Total annual carbon release

$$C = A + B$$

Where:

A= Immediate Release from burning

B= Delayed Emissions from decay

- To calculate Immediate Release from burning A

$$A=R= (E \times F \times H \times J) + (E \times L \times N \times P)$$

Where:

E = Annual Loss of Biomass (kt dm) : E= AxD

A = Area Converted Annually, D= Net Change in Biomass Density

F = Fraction of Biomass Burned on Site = 0.5

H= Fraction of Biomass oxidized on Site = 0.9

J = Carbon Fraction of Above- ground Biomass (burned on) = 0.5

L = Fraction of Biomass Burned off Site = 0.5

N = Fraction of Biomass Oxidized off Site= 0.9

P = Carbon Fraction of Above- ground Biomass (burned off site) = 0.5

- to calculate Delayed Emissions from decay

$$B=I = A \times D \times F \times H$$

Where:

A= Average Area Converted (10 Year Average)

D= Net Change in Biomass Density

F= Fraction Left to Decay = 1

H= Carbon Fraction in Above- ground Biomass = 0.5

MODULE		LAND-USE CHANGE AND FORESTRY				
SUBMODULE		FOREST AND GRASSLAND CONVERSION - CO_2 FROM BIOMASS				
WORKSHEET		5-2				
SHEET		1 OF 5 BIOMASS CLEARED				
COUNTRY		SYRIA				
YEAR		1994				
		STEP 1				
Vegetation types		A	B	C	D	E
		Area Converted Annually (kha)	Biomass Before Conversion (t dm/ha)	Biomass After Conversion (t dm/ha)	Net Change in Biomass Density (t dm/ha)	Annual Loss of Biomass (kt dm)
					D = (B - C)	E = (A x D)
Temperate	Coniferous	0.75	220	6	214.00	160.50
	Broadleaf	2.25	175	4	171.00	384.75
Grasslands		415	10	2	8.00	3,320.00
Other		25	10	3	7.00	175.00
Subtotals		**443.00**			**400.00**	**4,040.25**

MODULE		LAND-USE CHANGE AND FORESTRY					
SUBMODULE		FOREST AND GRASSLAND CONVERSION - CO_2 FROM BIOMASS					
WORKSHEET		5-2					
SHEET		2 OF 5 CARBON RELEASED BY ON-SITE BURNING					
COUNTRY		SYRIA					
YEAR		1994					
		STEP 2					
Vegetation types		F	G	H	I	J	K
		Fraction of Biomass Burned on Site	Quantity of Biomass Burned on Site (kt dm)	Fraction of Biomass Oxidised on Site	Quantity of Biomass Oxidised on Site (kt dm)	Carbon Fraction of Above-ground Biomass (burned on site)	Quantity of Carbon Released (from biomass burned) (kt C)
			G=(ExF)		I=(GxH)		K=(IxJ)
Temperate	Coniferous	0.5	80.25	0.9	72.23	0.5	36.11
	Broadleaf	0.5	192.38	0.9	173.14	0.5	86.57
Grasslands		0.5	1,660.00	0.9	1,494.00	0.5	747.00
Other		0.5	87.50	0.9	78.75	0.5	39.38
						Subtotal	**909.06**

MODULE	LAND-USE CHANGE AND FORESTRY
SUBMODULE	FOREST AND GRASSLAND CONVERSION - CO_2 FROM BIOMASS
WORKSHEET	5-2
SHEET	3 OF 5 CARBON RELEASED BY OFF-SITE BURNING
COUNTRY	SYRIA
YEAR	1994

		STEP 3						STEP 4
Vegetation types		L	M	N	O	P	Q	R
		Fraction of Biomass Burned off Site	Quantity of Biomass Burned off Site (kt dm)	Fraction of Biomass Oxidised off Site	Quantity of Biomass Oxidised off Site (kt dm)	Carbon Fraction of Above- ground Biomass (burned off site)	Quantity of Carbon Released (from biomass burned off site) (kt C)	Total Carbon Released (from on and off site burning) (kt C)
			M=(ExL)		O=(MxN)		Q=(OxP)	R=(K+Q)
Temperate	Coniferous	0.5	80.25	0.9	72.23	0.5	36.11	72.23
	Broadleaf	0.5	192.38	0.9	173.14	0.5	86.57	173.14
Grasslands		0.5	1,660.00	0.9	1,494.00	0.5	747.00	1,494.00
Other		0.5	87.50	0.9	78.75	0.5	39.38	78.75
	Subtotals		**2,020.13**				**909.06**	**1,818.11**

MODULE	LAND-USE CHANGE AND FORESTRY
SUBMODULE	FOREST AND GRASSLAND CONVERSION - CO_2 FROM BIOMASS
WORKSHEET	5-2
SHEET	4 OF 5 CARBON RELEASED BY DECAY OF BIOMASS
COUNTRY	SYRIA
YEAR	1994

		STEP 5								
Vegetation types		A	B	C	D	E	F	G	H	I
		Average Area Converted (10 Year Average) (kha)	Biomass Before Conversion (t dm/ha)	Biomass After Conversion (t dm/ha)	Net Change in Biomass Density (t dm/ha)	Average Annual Loss of Biomass (kt dm)	Fraction Left to Decay	Quantity of Biomass Left to Decay (kt dm)	Carbon Fraction in Above-ground Biomass	Carbon Released from Decay of Above-ground Biomass (kt C)
					D=(B-C)	E=(AxD)		G=(ExF)		I=(GxH)
Temperate	Coniferous	7.5	220	10	210.00	1,575.00	1	1,575.00	0.5	787.50
	Broadleaf	22.5	176	10	166.00	3,735.00	1	3,735.00	0.5	1,867.50
Grasslands		415	10	3	7.00	2,905.00	1	2,905.00	0.5	1,452.50
Other					0.00	0.00		0.00		0.00
									Subtotal	**4,107.50**

MODULE	LAND-USE CHANGE AND FORESTRY
SUBMODULE	FOREST AND GRASSLAND CONVERSION - CO_2 FROM BIOMASS
WORKSHEET	5-2
SHEET	5 OF 5 SUMMARY AND CONVERSION TO CO_2
COUNTRY	SYRIA
YEAR	1994

STEP 6			
A	B	C	D
Immediate Release From Burning	Delayed Emissions From Decay	Total Annual Carbon Release	Total Annual CO_2 Release
(kt C)	(kt C)	(kt C)	(Gg CO_2)
	(10-year average)		
		C = A + B	D = C x (44/12)
1,818.11	**4,107.50**	**5,925.61**	**21,727.25**

5.2.3. ON-Site Burning of Forests - NON-CO_2 Trace GASES

$$CO2 \text{ emission} = S = R \times \frac{44}{12} (Kt\ CO_2)$$

$$CH_4 \text{ emission} = \frac{16}{12} \times 0.012 \times R\ (Kt\ CH_4)$$

$$N_2O \text{ emission} = \frac{44}{28} \times 0.01 \times 0.007 \times R\ (Kt\ N_2O)$$

$$CO \text{ emission} = \frac{28}{12} \times 0.06 \times R\ Kt\ CO)$$

$$NOx \text{ emission} = \frac{46}{14} \times 0.01 \times 0.121 \times R\ (Kt\ NOx)$$

MODULE	**LAND-USE CHANGE AND FORESTRY**
SUBMODULE	**ON-SITE BURNING OF FORESTS - NON-CO_2 TRACE GASES FROM BURNING BIOMASS**
WORKSHEET	**5-3**
SHEET	**1 OF 1 NON-CO_2 GAS EMISSIONS**
COUNTRY	**SYRIA**
YEAR	**1994**

STEP 1			**STEP 2**				
A	B	C		D	E	F	G
Quantity of Carbon Released (kt C)	Nitrogen-Carbon Ratio	Total Nitrogen Released (kt N)		Trace Gas Emissions Ratios	Trace Gas Emissions (kt C)	Conversion Ratio	Trace Gas Emissions from Burning of Cleared Forests (Gg CH_4,CO)
(From column K, sheet 2 of Worksheet 5-2)		C=(AxB)			E = (A x D)		G = (E x F)
			CH_4	0.012	10.91	16/12	14.54
			CO	0.06	54.54	28/12	127.27
					(kt N)		(Gg N_2O, NO_x)
909.06	0.01	9.09			E = (C x D)		G = (E x F)
			N_2O	0.007	0.06	44/28	0.10
			NO_x	0.121	1.10	46/14	3.61

5.2.4. Annual Carbon Uptake in Above Ground Biomass

$$M = [(A \times B \times D) + (G \times H \times J)] \times (44/12)$$

Where:

A = 20-Year Total Area not cultivated and Re-growth

B= Annual Rate of Above ground Biomass Growth

D= Carbon Fraction of Above ground Biomass

G = Total Area Abandoned for more than Twenty Years

H= Annual Rate of Above ground Biomass Growth

J = Carbon Fraction of Above ground Biomass = 0.5

MODULE	LAND-USE CHANGE AND FORESTRY				
SUBMODULE	ABANDONMENT OF MANAGED LANDS				
WORKSHEET	5-4				
SHEET	1 OF 3 CARBON UPTAKE BY ABOVEGROUND REGROWTH - FIRST 20 YEARS				
COUNTRY	SYRIA				
YEAR	1994				
	STEP 1				
Vegetation types	A	B	C	D	E
	20-Year Total Area Abandoned and Regrowing (kha)	Annual Rate of Aboveground Biomass Growth (t dm/ha)	Annual Aboveground Biomass Growth (kt dm)	Carbon Fraction of Aboveground Biomass	Annual Carbon Uptake in Aboveground Biomass (kt C)
			C=(AxB)		E=(CxD)
Temperate – Coniferous	26	3	78.00	0.5	39.00
Temperate – Broadleaf	75	2	150.00	0.5	75.00
Grasslands	415	2	830.00	0.5	415.00
Other			0.00		0.00
				Subtotal	**529.00**

MODULE	LAND-USE CHANGE AND FORESTRY				
SUBMODULE	ABANDONMENT OF MANAGED LANDS				
WORKSHEET	5-4				
SHEET	2 OF 3 CARBON UPTAKE BY ABOVEGROUND REGROWTH - > 20 YEARS				
COUNTRY	SYRIA				
YEAR	1994				
	STEP 2				
Vegetation types	G	H	I	J	K
	Total Area Abandoned for more than Twenty Years (kha)	Annual Rate of Aboveground Biomass Growth (t dm/ha)	Annual Aboveground Biomass Growth (kt dm)	Carbon Fraction of Aboveground Biomass	Annual Carbon Uptake in Aboveground Biomass (kt C)
			I=(GxH)		K = (I x J)
Temperate – Coniferous	26	3	78.00	0.5	39.00
Temperate – Broadleaf	75	2	150.00	0.5	75.00
Grasslands	415	2	830.00	0.5	415.00
Other			0.00		0.00
				Subtotal	**529.00**

MODULE	LAND-USE CHANGE AND FORESTRY
SUBMODULE	ABANDONMENT OF MANAGED LANDS
WORKSHEET	5-4
SHEET	3 OF 3 TOTAL CO_2 REMOVALS FROM ABANDONED LANDS
COUNTRY	SYRIA
YEAR	1994
STEP 3	
L	M
Total Carbon Uptake from Abandoned Lands (kt C)	Total Carbon Dioxide Uptake ($Gg\ CO_2$)
L = (E + K)	M = (L x (44/12))
1,058.00	**3,879.33**

5.2.5. CO2 Emission from Soils

Total Annual CO2 Emission

$$D= (A \times B) \times (44/12)$$

Where:

A = Net change in soil carbon in mineral soils and total carbon loss from organic soils and carbon emission from liming

B= unit conversion value

MODULE	LAND-USE CHANGE AND FORESTRY						
SUBMODULE	CHANGE IN SOIL CARBON FOR MINERAL SOILS						
WORKSHEET	5-5						
SHEET	1 OF 4						
YEAR	1994						
STEPS 1 AND 2					STEP 3		
A	B	C	D	E	F	G	H
Land-use/ Management Systems	Soil type	Soil Carbon (t) (Mg C/ha)	Land Area (t-20) (Mha)	Land Area (t) (Mha)	Soil Carbon (t-20) (Tg)	Soil Carbon (t) (Tg)	Net change in Soil Carbon in Mineral Soils (Tg per 20 yr)
					F = (C x D)	G = (C x E)	H = (G - F)
All Systems	High activity soils		5.89	5.89	331.71	331.71	0.00
	Low activity soils		8.60	8.60	580.02	580.02	0.00
	Sandy		3.00	3.00	34.65	34.65	0.00
	Volcanic		0.30	0.30	14.70	14.70	0.00
	Wetland (Aquic)		0.14	0.14	11.09	11.09	0.00
Totals			17.93	17.93			0.00
cultivated land	High activity soils	49.00	4.2	4.2	205.80	205.80	0.00
	Low activity soils	44.10	1	1	44.10	44.10	0.00
	Sandy	11.55	0	0	0.00	0.00	0.00
	Volcanic	49.00	0.3	0.3	14.70	14.70	0.00
	Wetland (Aquic)	79.20	0	0	0.00	0.00	0.00
SubTotal			5.50	5.50			0.00
uncultivated land	High activity soils	53.90	0	0	0.00	0.00	0.00
	Low activity soils	46.20	0.6	0.6	27.72	27.72	0.00
	Sandy	11.55	3	3	34.65	34.65	0.00
	Volcanic	53.90	0	0	0.00	0.00	0.00
	Wetland (Aquic)	79.20	0.14	0.14	11.09	11.09	0.00
SubTotal			3.74	3.74			0.00
grasslands	High activity soils	80.85	1.3	1.3	105.11	105.11	0.00
	Low activity soils	72.60	7	7	508.20	508.20	0.00
	Sandy	18.15	0	0	0.00	0.00	0.00
	Volcanic	84.70	0	0	0.00	0.00	0.00
	Wetland (Aquic)	145.20	0	0	0.00	0.00	0.00
SubTotal			8.30	8.30			0.00
Forest	High activity soils	53.90	0.386	0.386	20.81	20.81	0.00
	Low activity soils	46.20			0.00	0.00	0.00
	Sandy	11.55			0.00	0.00	0.00
	Volcanic	53.90			0.00	0.00	0.00
	Wetland (Aquic)	79.20			0.00	0.00	0.00
SubTotal			0.39	0.39			0.00

MODULE	**LAND-USE CHANGE AND FORESTRY**
SUBMODULE	**SOIL CARBON FOR AGRICULTURALLY IMPACTED LANDS**
WORKSHEET	**5-5A (SUPPLEMENTAL)**
SHEET	**1 OF 1**
COUNTRY	**SYRIA**
YEAR	**1994**

A	B	C	D	E	F	G
Land-use/ Management Systems	Soil type	Soil Carbo under Native Vegetation (Mg C/ha)	Base Factor	Tillage Factor	Input Factors	Soil Carbon in Agriculturally Impacted Lands (Mg C/ha)
						G = (C x D x E x F)
All Systems	High Activity Soils	280.00	3.20	4.25	4.00	237.65
	Low Activity Soils	240.00	3.20	4.35	4.00	209.10
	Sandy	60.00	3.20	4.40	4.00	52.80
	Volcanic	280.00	3.20	4.30	4.00	241.50
	Wetland (Aquic)	480.00	2.90	4.40	4.00	382.80
cultivated land	High Activity Soils	70	0.7	1	1	49.00
	Low Activity Soils	60	0.7	1.05	1	44.10
	Sandy	15	0.7	1.1	1	11.55
	Volcanic	70	0.7	1	1	49.00
	Wetland (Aquic)	120	0.6	1.1	1	79.20
uncultivated land	High Activity Soils	70	0.7	1.1	1	53.90
	Low Activity Soils	60	0.7	1.1	1	46.20
	Sandy	15	0.7	1.1	1	11.55
	Volcanic	70	0.7	1.1	1	53.90
	Wetland (Aquic)	120	0.6	1.1	1	79.20
Grsslands	High Activity Soils	70	1.1	1.05	1	80.85
	Low Activity Soils	60	1.1	1.1	1	72.60
	Sandy	15	1.1	1.1	1	18.15
	Volcanic	70	1.1	1.1	1	84.70
	Wetland (Aquic)	120	1.1	1.1	1	145.20
Forest	High Activity Soils	70	0.7	1.1	1	53.90
	Low Activity Soils	60	0.7	1.1	1	46.20
	Sandy	15	0.7	1.1	1	11.55
	Volcanic	70	0.7	1.1	1	53.90
	Wetland (Aquic)	120	0.6	1.1	1	79.20

MODULE	LAND-USE CHANGE AND FORESTRY		
SUBMODULE	CARBON EMISSIONS FROM INTENSIVELY-MANAGED ORGANIC SOILS		
WORKSHEET	5-5		
SHEET	2 OF 4		
COUNTRY	SYRIA		
YEAR	1994		
	STEP 4		
	A	B	C
Agricultural Use of Organic Soils	Land Area (ha)	Annual Loss Rate (Mg C/ha/yr) (Default)	Net Carbon Loss from Organic Soils (Mg/yr)
			C = (A x B)
Cool temperate			
Upland crops			0.00
Pasture/Forest			0.00
Warm temperate			
Upland crops	500,000	10	5,000,000.00
Pasture/Forest			0.00
Tropical			
Upland crops			0.00
Pasture/Forest			0.00
		Total	**5,000,000.00**

MODULE	LAND-USE CHANGE AND FORESTRY		
SUBMODULE	CARBON EMISSIONS FROM LIMING OF AGRICULTURAL SOILS		
WORKSHEET	5-5		
SHEET	3 OF 4		
COUNTRY	SYRIA		
YEAR	1994		
	STEP 5		
	A	B	C
Type of lime	Total Annual Amount of Lime (Mg)	Carbon Conversion Factor	Carbon Emissions from Liming (Mg C)
			C = (A x B)
Limestone $Ca(CO_3)$	2628000	0.12	315,360.00
Dolomite $CaMg(CO_3)_2$		0.122	0.00
		Total	**315,360.00**

MODULE	LAND-USE CHANGE AND FORESTRY			
SUBMODULE	CALCULATION OF TOTAL CO_2-C EMISSIONS FROM AGRICULTURALLY- IMPACTED SOILS			
WORKSHEET	5-5			
SHEET	4 OF 4			
COUNTRY	SYRIA			
YEAR	1994			
	STEP 6			
Source	A	B	C	D
	Worksheet Values	Unit Conversion Factor	Total Annual Carbon Emissions (Gg)	Convert to Total Annual CO_2 Emission(Gg/yr)
			C = (A x B)	D= C x (44/12)
Total Net Change in Soil Carbon in Mineral Soils	0.00	-50	0.00	0.00
Total Net Carbon Loss from Organic Soils	5,000,000.00	0.001	5,000.00	18,333.33
Carbon Emissions from Liming	315,360.00	0.001	315.36	1,156.32
			Total	**19,489.65**

5.3. Summary of GHG Emissions from Agriculture and Forest Sectors on 1994:

Country	Syria
Inventory Year	1994

TABLE 4 SECTORAL REPORT FOR AGRICULTURE
(Sheet 1 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH_4	N_2O	NO_x	CO	NMVOC
Total Agriculture	**107**	**24**	**5**	**291**	**0**
A Enteric Fermentation	**90**				
1 Cattle	24				
2 Buffalo	0				
3 Sheep	56				
4 Goats	5				
5 Camels and Llamas	0				
6 Horses	0				
7 Mules and Asses	2				
8 Swine	0				
9 Poultry	2				
10 Other (please specify)					
B Manure Management	**4**	**0**			
1 Cattle	1				
2 Buffalo	0				
3 Sheep	2				
4 Goats	0				
5 Camels and Llamas	0				
6 Horses	0				
7 Mules and Asses	0				
8 Swine	0				
9 Poultry	0				
B Manure Management (cont...)					
10 Anaerobic		0			
11 Liquid Systems		0			
12 Solid Storage and Dry Lot		0			
13 Other (please specify)		0			
C Rice Cultivation	**0**				
1 Irrigated	0				
2 Rainfed	0				
3 Deep Water	0				
4 Other (please specify)					
D Agricultural Soils		**23**			
E Prescribed Burning of Savannas	**2**	**0**	**1**	**45**	
F Field Burning of Agricultural Residues [1]	**12**	**0**	**4**	**245**	
1 Cereals					
2 Pulse					
3 Tuber and Root					
4 Sugar Cane					
5 Other (please specify)					
G Other (please specify)					

Country	Syria
Inventory Year	1994

TABLE 5 SECTORAL REPORT FOR LAND-USE CHANGE AND FORESTRY

(Sheet 1 of 1)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES **(Gg)**						
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NO_x	CO
Total Land-Use Change and Forestry	(1) **0**	(1) -65,933	**15**	**0**	**4**	**127**
A Changes in Forest and Other Woody Biomass Stocks	(1) **0**	(1) -121,118				
1 Tropical Forests						
2 Temperate Forests						
3 Boreal Forests						
4 Grasslands/Tundra						
5 Other (please specify)						
B Forest and Grassland Conversion	**43,454**		**15**	**0**	**4**	**127**
1 Tropical Forests	43,454					
2 Temperate Forests	0					
3 Boreal Forests	0					
4 Grasslands/Tundra	0					
5 Other (please specify)	0					
C Abandonment of Managed Lands		-7,759				
1 Tropical Forests		-7,759				
2 Temperate Forests		0				
3 Boreal Forests		0				
4 Grasslands/Tundra		0				
5 Other (please specify)		0				
D CO2 Emissions and Removals from Soil	(1) **19,490**	(1) **0**				
E Other (please specify)						

Country	Syria
Inventory Year	1994

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES

(Sheet 2 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)									
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 Emissions		CO_2 Removals		CH_4	N_2O	NO_x	CO	NMVOC	SO_2
3 Solvent and Other Product Use		**0**				**0**			**0**	
4 Agriculture					**107**	**24**	**5**	**291**		
A Enteric Fermentation					90					
B Manure Management					4	0				
C Rice Cultivation					0					
D Agricultural Soils						23				
E Prescribed Burning of Savannas					2	0	1	45		
F Field Burning of Agricultural Residues					12	0	4	245		
G Other (please specify)					0	0				
5 Land-Use Change & Forestry [2]	**(1)**	**0**	**(1)**	**-65,933**	**15**	**0**	**4**	**127**		
A Changes in Forest and Other Woody Biomass Stocks	(1)	0	(1)	-121,118						
B Forest and Grassland Conversion		43,454			15	0	4	127		
C Abandonment of Managed Lands				-7,759						
D CO_2 Emissions and Removals from Soil	(1)	19,490	(1)	0						
E Other (please specify)		0		0	0	0	0	0		

5.4. Results:

- Agriculture sector1994 :

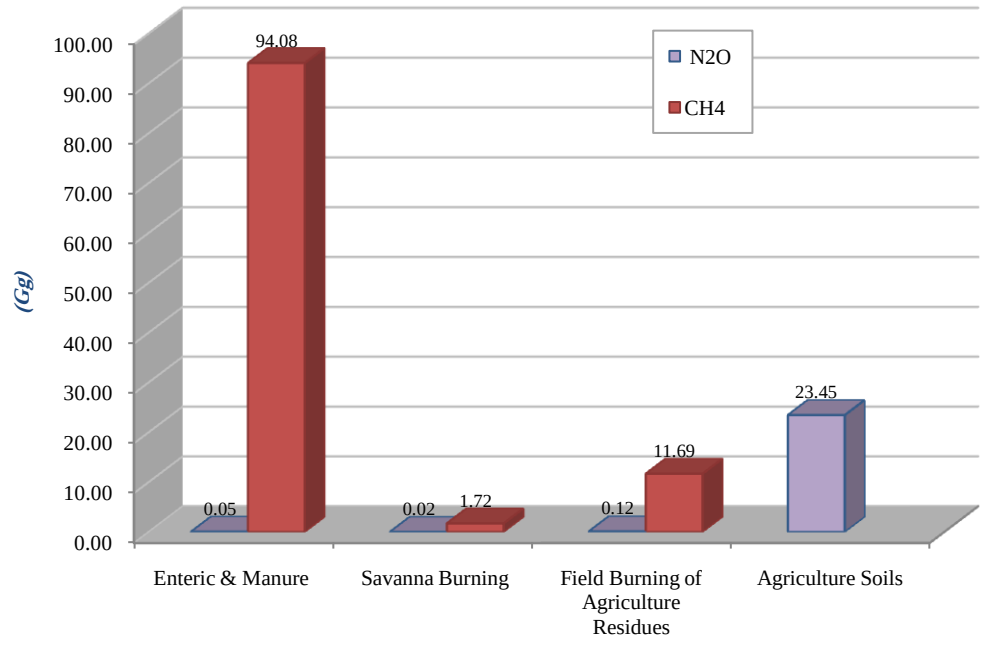

Fig (3) CH4, N2O emission from agriculture 1994

It is noticed that: the highest emission for Ch4 is from Animal management and the highest emission for N2O is from soil management and fertilizing

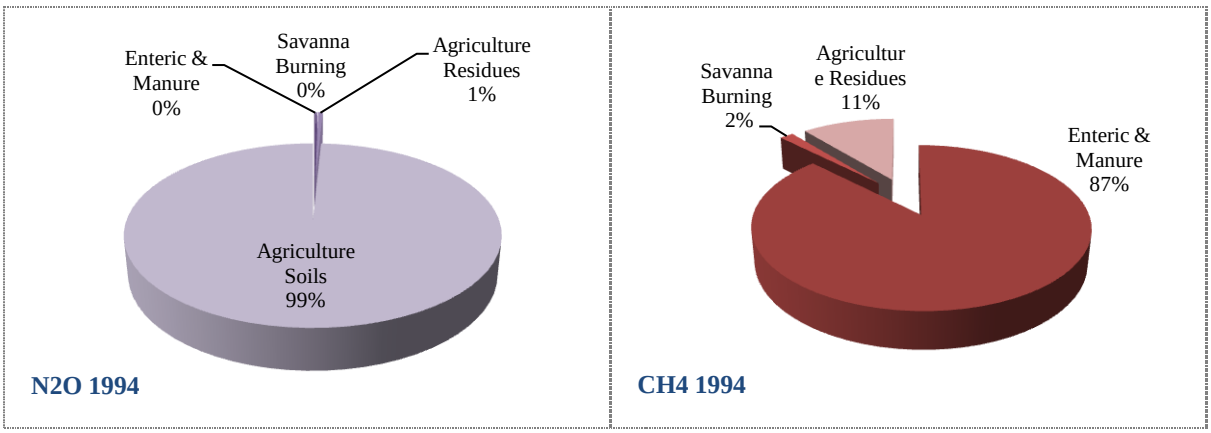

Fig (4) CH4, N2O emission from agriculture 1994

➢ Forest and Land use Sector 1994

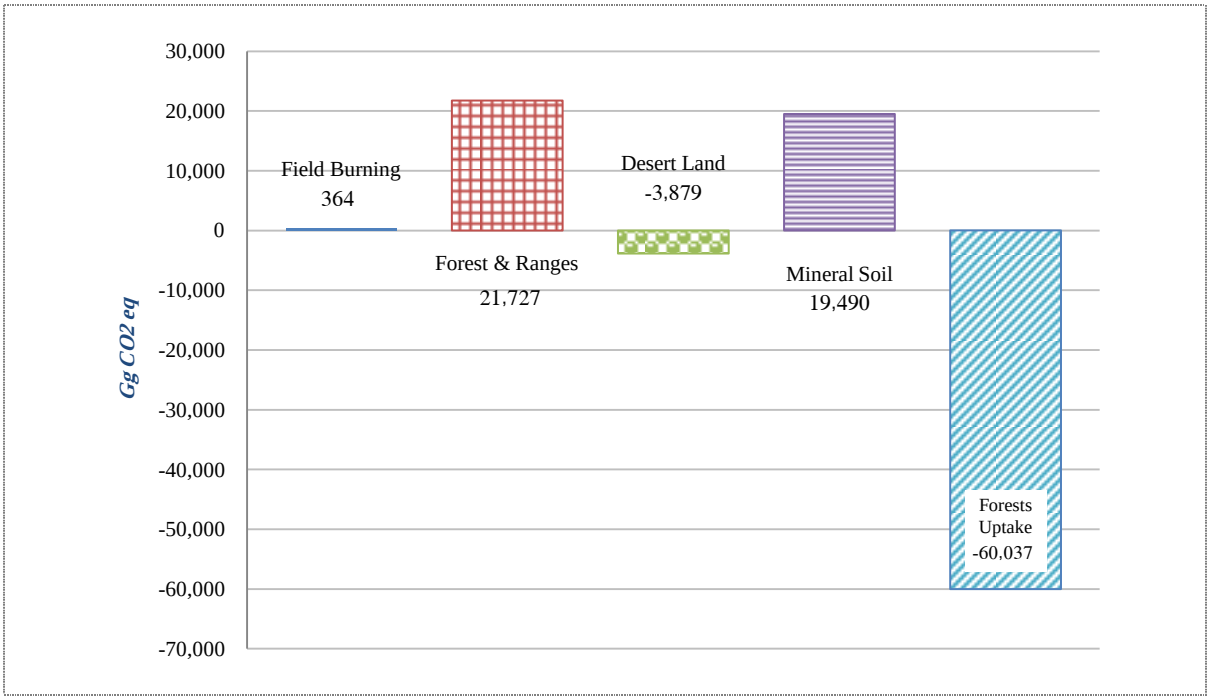

Fig (5) CO_2 emission and removal from forest sector 1994

It is noticed that in forests: CO2 removal is larger than its emission

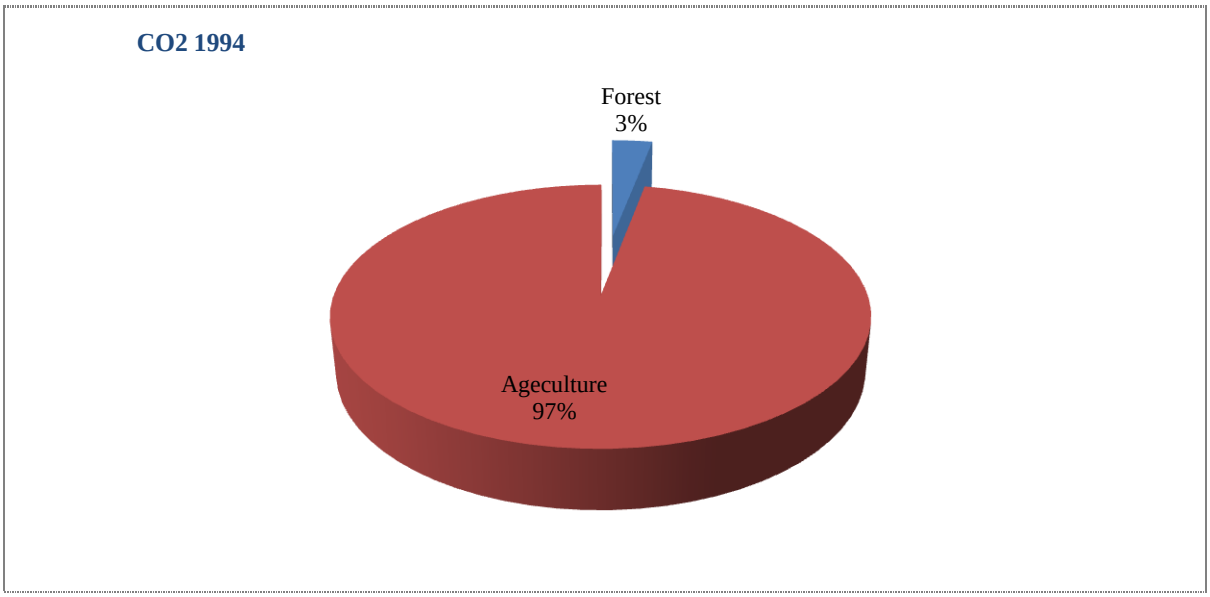

Fig (6) CO_2 emission from agriculture and forest sector 1994

It is noticed :CO2 emission from agriculture presents 97% of total emissions, while forest emissions present only 3% .

5.4.1. GHG Emissions Development from Agriculture Sector

Following is the results of GHG calculation in agricultural sector according to IPCC 1996 (tier 1)

- From Enteric fermentation and manure management

Table (12): CH4, N2O Emissions from grazing animals and their waste

Years	Methan Emissions from Enteric Fermentation	Metrhan Emissions from Manure Management	Total Methan Annual Emissions from Domestic Livestock	Nitrogen Excretion FROM ANIMAL WASTE MANAGEMENT SYSTEMS (AWMS)'	Total Annual Emissions 'of N2O
	(t/yr)	(t/yr)	(Gg)	(kg N/yr)	'(Gg)
1994	90495.87	3583.54	94.08	220900500.00	0.05
1995	97185.10	3849.06	101.03	246598500.00	0.05
1996	103714.00	4075.80	107.79	261800200.00	0.05
1997	109074.23	4265.29	113.34	273436000.00	0.06
1998	119987.37	4685.27	124.67	298164000.00	0.06
1999	109074.23	4265.29	113.34	273436000.00	0.06
2000	112508.59	4480.22	116.99	276743800.00	0.06
2001	100435.27	4003.45	104.44	249797300.00	0.06
2002	107486.18	4342.57	111.83	266293100.00	0.07
2003	118829.79	4660.61	123.49	291977700.00	0.07
2004	133926.74	5255.37	139.18	329581400.00	0.08
2005	147050.02	5631.62	152.68	362061600.00	0.07
2006	158866.68	6140.93	165.01	394435300.00	0.08

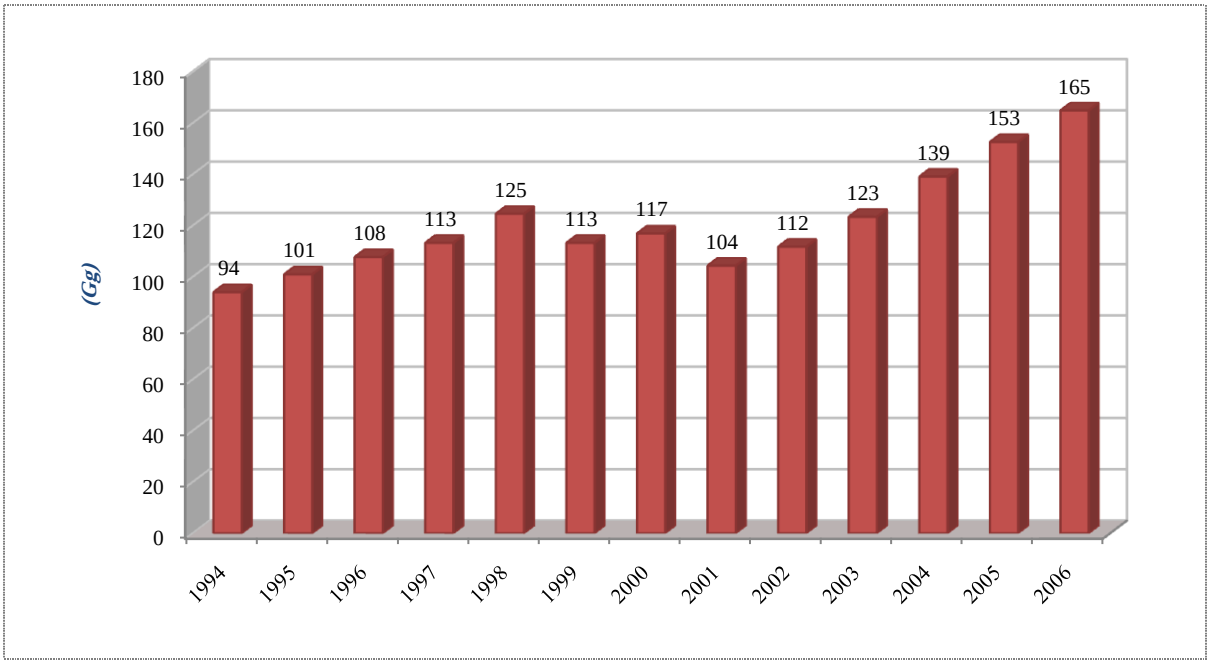

Fig (7) Development of CH_4 Emission from Animal Raising Sector 1994-2006

It is noticed that: CH4 gas emission has increased about 71 Kt in the period 1994-2006 , in an annual increment about 7.7%

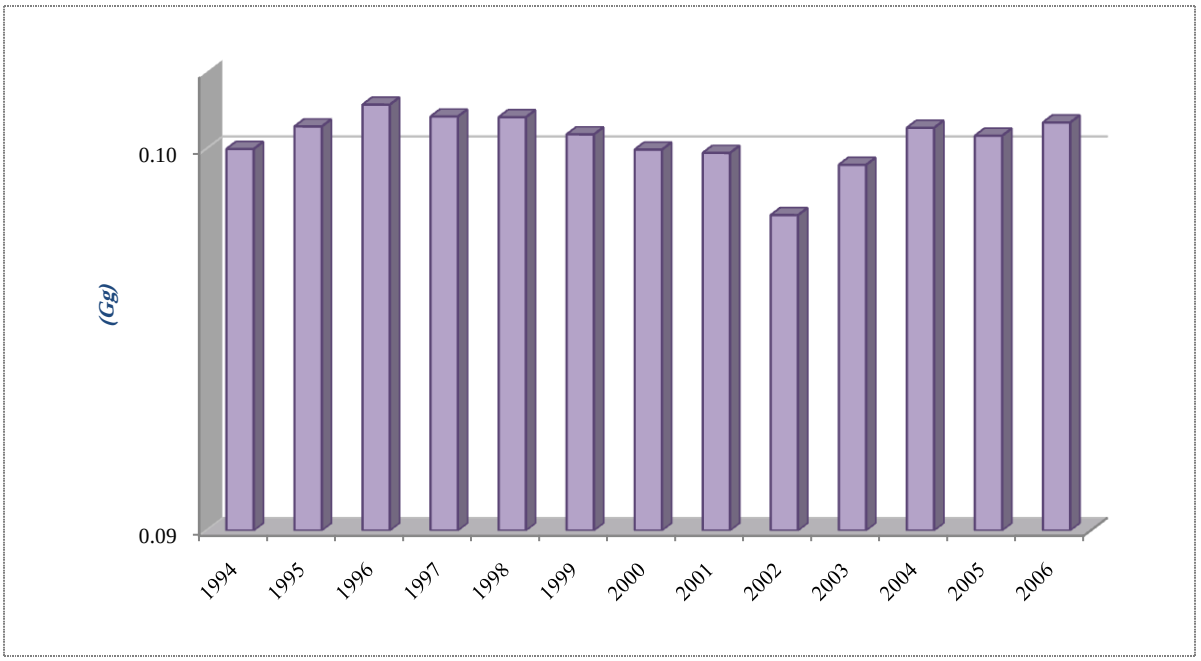

Fig (8) Development of N_2O Emission from Animal Raising Sector 1994-2006

- GHG Emissions from Savanna Burning:

It was calculated according to IPCC 1996 TIER 1 , and table (13) shows the emissions from savanna burning

Table (13) GHG Emissions from Savanna Burning

Years	Total Carbon Released'	Total Nitrogen Content	Emissions from Savanna Burning '(Gg)			
	(Gg C)	'(Gg N)	CH_4	CO	N_2O	NO_x
1994	323.40	1.94	1.72	45.28	0.02	0.77
1995	322.62	1.94	1.72	45.17	0.02	0.77
1996	324.18	1.95	1.73	45.39	0.02	0.77
1997	322.62	1.94	1.72	45.17	0.02	0.77
1998	322.62	1.94	1.72	45.17	0.02	0.77
1999	322.62	1.94	1.72	45.17	0.02	0.77
2000	323.40	1.94	1.72	45.28	0.02	0.77
2001	322.62	1.94	1.72	45.17	0.02	0.77
2002	324.96	1.95	1.73	45.49	0.02	0.78
2003	324.96	1.95	1.73	45.49	0.02	0.78
2004	322.62	1.94	1.72	45.17	0.02	0.77
2005	324.96	1.95	1.73	45.49	0.02	0.78
2006	323.40	1.94	1.72	45.28	0.02	0.77

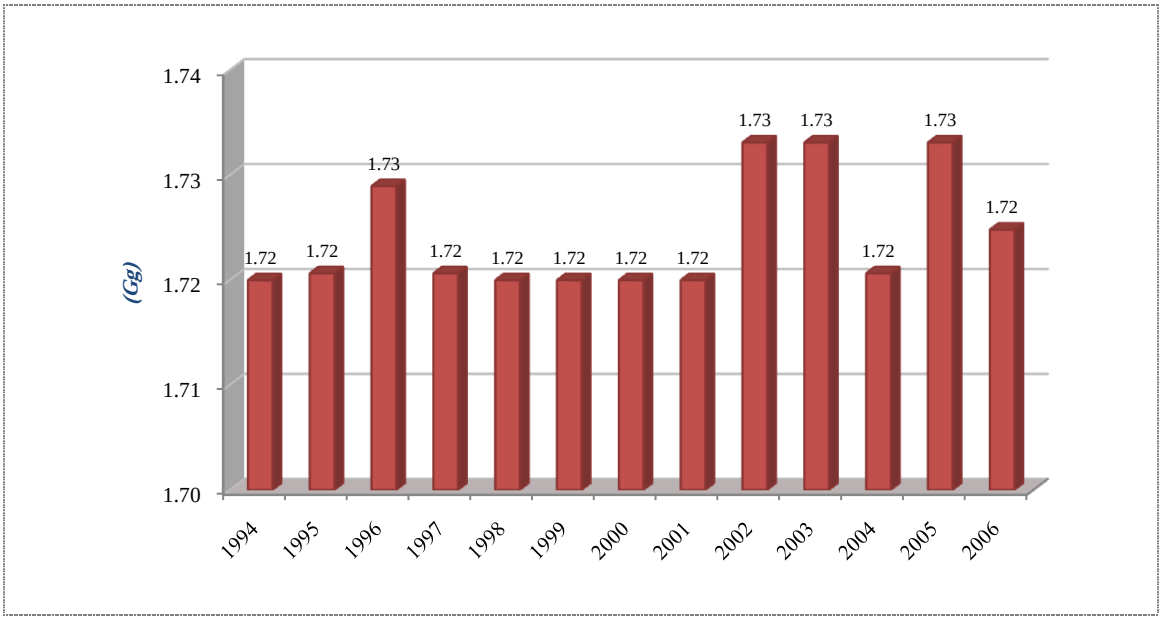

Fig (9) Development of CH4 Emission from Savanna Burning 1994-2006

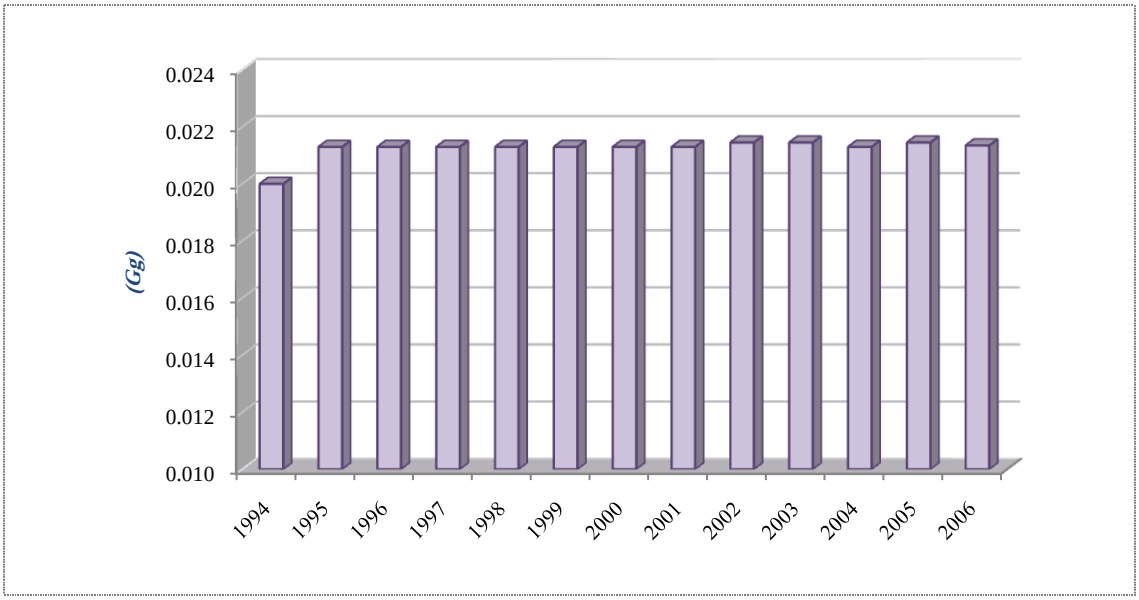

Fig (10) Development of N2O Emission from Savanna Burning 1994-2006

The schemas show that the emissions of CH4 and N2O from savanna burning are stable

- GHG emissions from Burning of 'Agricultural 'Residues

It was calculated according to IPCC 1996 TIER 1 , and table (14) shows the emissions from Burning of 'Agricultural 'Residues

Table (14) Emissions from Burning of 'Agricultural 'Residues

Years	Total Carbon Released	Total Nitrogen' Released	Emissions ' from Field Burning of 'Agricultural 'Residues '(Gg)			
	(Gg C)	(Gg N)	CH_4	CO	N_2O	NO_x
1994	1753.29	10.52	11.69	245.46	0.12	4.18
1995	1993.45	11.96	13.29	279.08	0.13	4.76
1996	1992.69	11.96	13.28	278.98	0.13	4.75
1997	1883.06	11.30	12.55	263.63	0.12	4.49
1998	1991.87	11.95	13.28	278.86	0.13	4.75
1999	1992.69	11.96	13.28	278.98	0.13	4.75
2000	1506.84	9.04	10.05	210.96	0.10	3.59
2001	2362.88	14.18	15.75	330.80	0.16	5.64
2002	2124.60	12.75	14.16	297.44	0.14	5.07
2003	2203.93	13.22	14.69	308.55	0.15	5.26
2004	2047.42	12.28	13.65	286.64	0.14	4.88
2005	2130.98	12.79	14.21	298.34	0.14	5.08
2006	2175.02	13.05	14.50	304.50	0.14	5.19

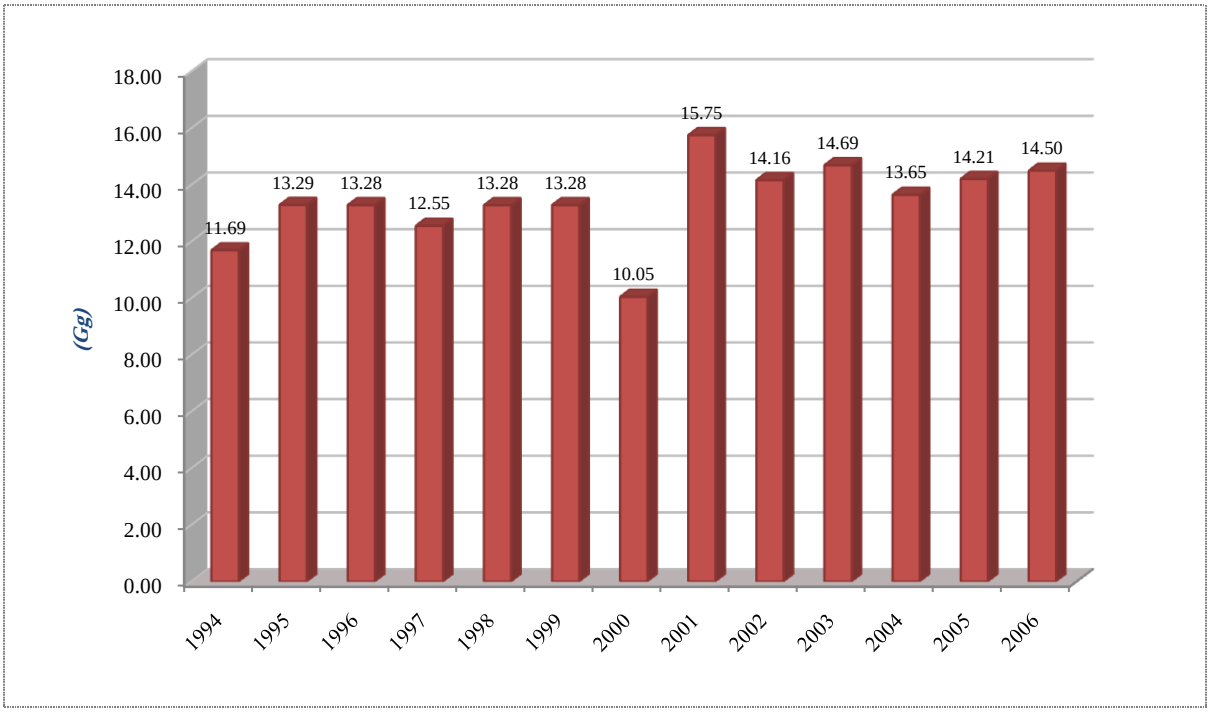

Fig (11) CH_4 Emission from Burning of 'Agricultural 'Residues

It is noticed that: CH4 gas emission has increased about 1.017 Kt in the period 1994-2006 , in an annual increment about 7.7%.

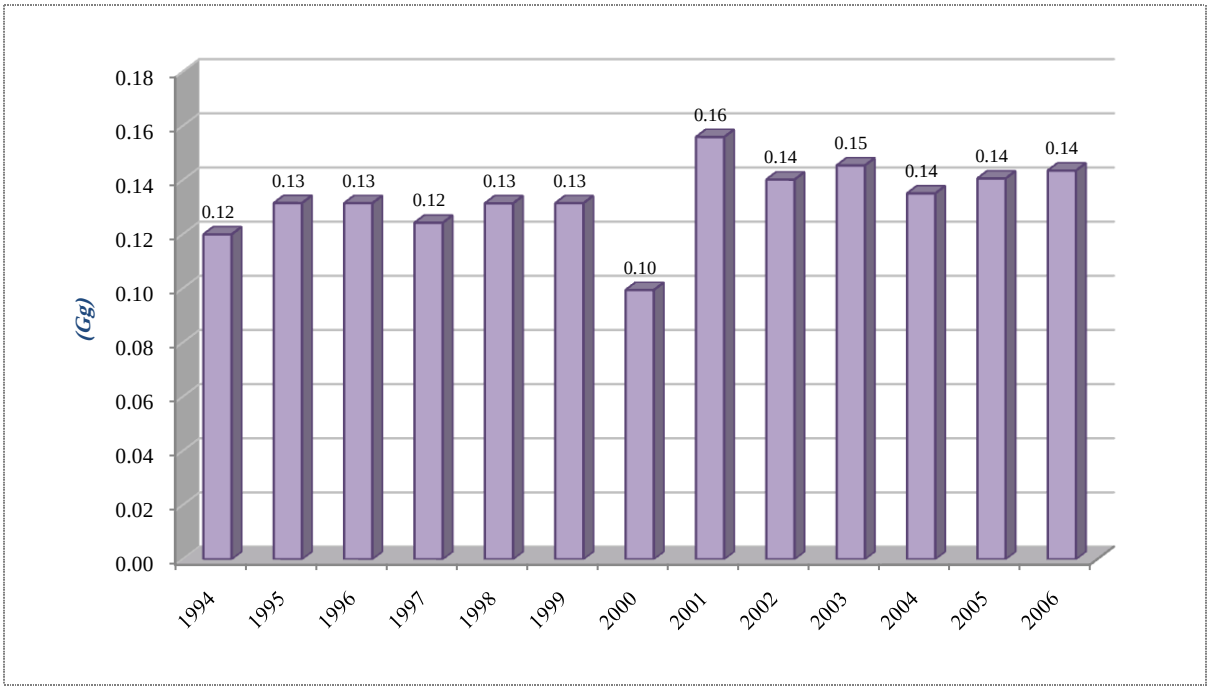

Fig (12) Development of N_2O Emission from Burning of 'Agricultural 'Residues 1994-2006

It is noticed that there is a little increase in N2O emission from burning of 'Agricultural 'Residues in the period of 1994-2006.

➢ Emissions from Agricultural Soils

It was calculated according to IPCC 1996 TIER 1, and table (15) shows the emissions from agricultural soils.

Table (15) Emissions from Agricultural Soils

Years	Direct N2O emissions from Agricultural fields, excluding Cultivation of Histosoils	Direct N2O Emissions 'from Histosoils	Total Direct ' Emissions of 'N2O	Emissions Of N_2O from 'Grazing Animals	Total Indirect 'Nitrous Oxide 'Emissions	Total Nitrous Oxide 'Emissions
	(Gg N_2O-N/yr)	(Gg)	(Gg)	(Gg)	(Gg N_2O/yr)	(Gg)
1994	6.62	0.00	10.40	6.78	6.28	23.45
1995	7.32	0.00	11.51	7.57	6.58	25.66
1996	7.20	0.00	11.32	8.04	7.06	26.42
1997	6.87	0.00	10.80	8.40	7.11	26.32
1998	7.52	0.00	11.81	9.17	7.56	28.55
1999	7.32	0.00	11.50	8.40	7.23	27.14
2000	7.11	0.00	11.18	8.49	7.47	27.13
2001	6.41	0.00	10.08	7.65	5.87	23.60
2002	6.49	0.00	10.20	8.13	6.58	24.91
2003	7.65	0.00	12.02	8.95	7.58	28.55
2004	7.74	0.00	12.16	10.10	7.94	30.20
2005	8.67	0.00	13.62	11.14	8.96	33.72
2006	9.14	0.00	14.37	12.12	9.57	36.06

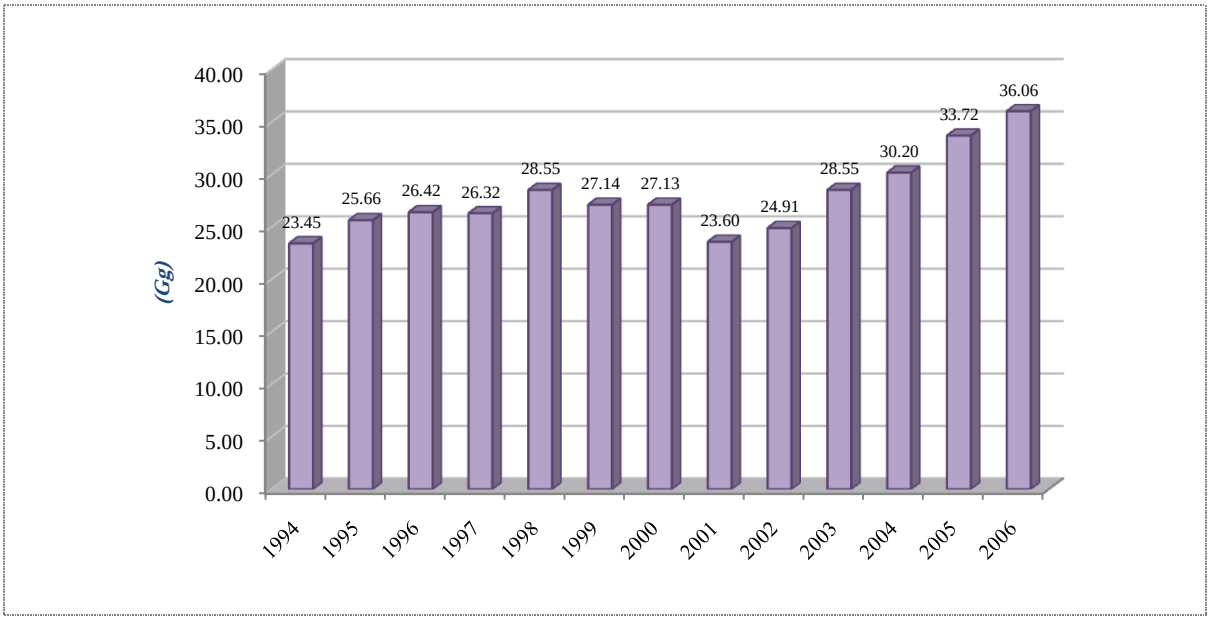

Fig (13) N_2O Emission from Agricultural Soils

It is noticed that there is an increase in N2O emission from agricultural soils about 12.5 Kt in the period of 1994-2006. in an annual increment about 7.7%

Table (16) Total CH_4, N_2O Emissions from Agriculture Sector in the period 1990 -2006

Years	CH_4	N_2O
	(Gg)	(Gg)
1990	121.63	26.69
1994	107.49	23.64
1995	116.04	25.86
1996	122.80	26.63
1997	127.61	26.52
1998	139.67	28.76
1999	128.34	27.35
2000	128.75	27.31
2001	121.91	23.83
2002	127.73	25.14
2003	139.92	28.79
2004	154.55	30.43
2005	168.62	33.96
2006	181.23	36.31

The latest schemas show:

1- CH_4 emission increase about 73.75 Kt in the period of 1994-2006. in an annual increment about 7.7%

2- N_2O emission increase about 12.76 Kt in the period of 1994-2006. in an annual increment about 7.7%

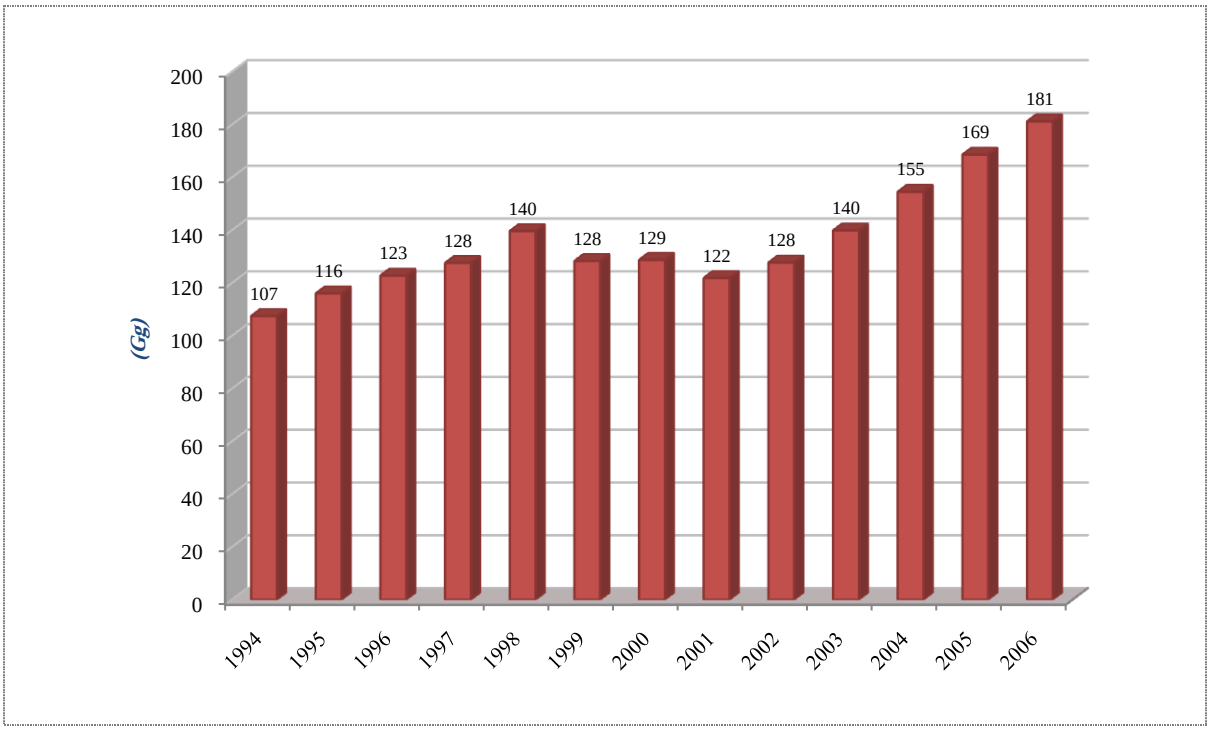

Fig (14) CH_4 Emission from Agriculture Sector

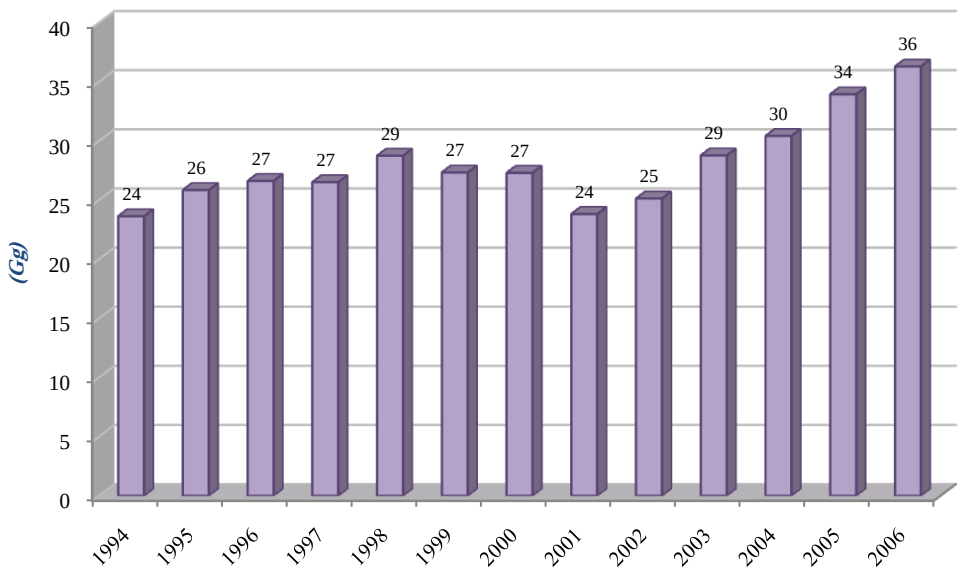

Fig (15) N2O Emission from Agriculture Sector

Table (17) Total GHG Emission from Agriculture Sector in Syria and its Equivalent from CO_2

Years	CH_4	CO_2 equivalent to CH_4	N_2O	CO_2 equivalent to N_2O	Total CO_2
	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)
1994	107.49	2257.29	23.64	7328.40	9585.69
1995	116.04	2436.93	25.86	8017.33	10454.26
1996	122.80	2578.87	26.63	8254.16	10833.03
1997	127.61	2679.89	26.52	8222.34	10902.23
1998	139.67	2933.11	28.76	8915.82	11848.92
1999	128.34	2695.23	27.35	8477.02	11172.25
2000	128.75	2703.84	27.31	8466.38	11170.22
2001	121.91	2560.14	23.83	7388.30	9948.43
2002	127.73	2682.24	25.14	7794.11	10476.36
2003	139.92	2938.24	28.79	8924.11	11862.35
2004	154.55	3245.60	30.43	9433.50	12679.10
2005	168.62	3541.05	33.96	10526.63	14067.67
2006	181.23	3805.88	36.31	11254.88	15060.76

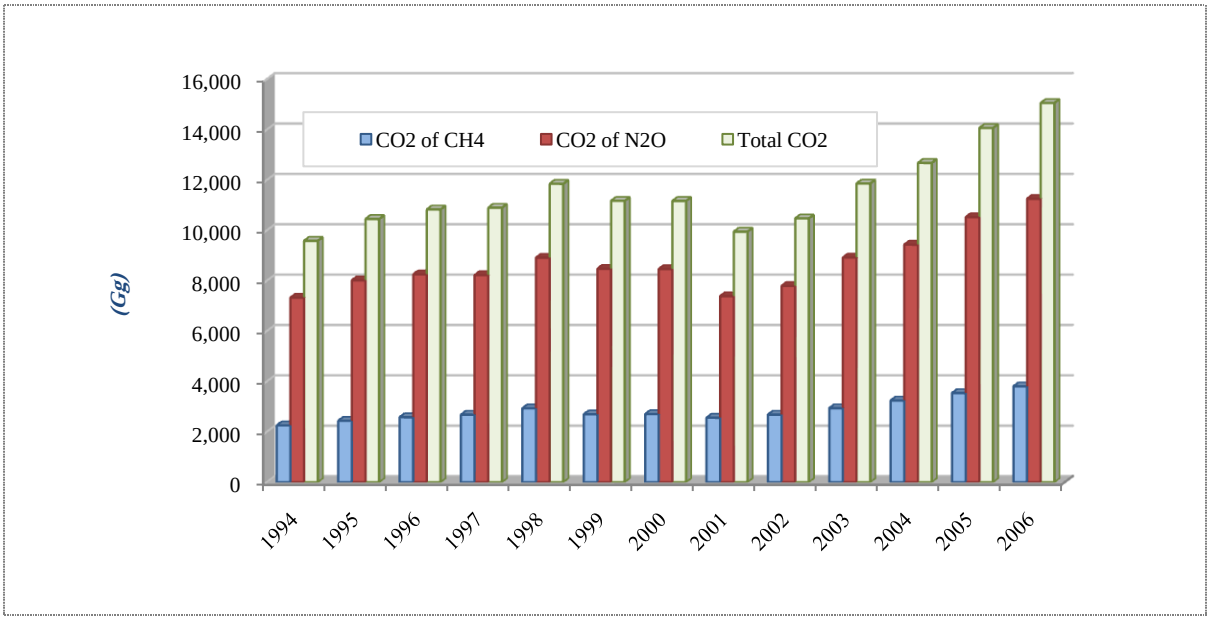

Fig (16) CO_2 Emissions from Agriculture Sector

It is noticed that the total CO_2 emission equivalent to (CH_4, N_2O) is increased about 5643.38 Kt in the period of 1994-2006. in an annual increasment about 7.7%

5.4.2. GHG Emissions in Forests and Land Use:

- Changes in Forest and Other Woody Biomass Stocks

Table (18) Changes in Forest and other Woody Biomass Stocks

years	Total Carbon Uptake Increment	Wood Removed From Forest Clearing	Total Biomass Consumption From Stocks	Annual Carbon 'Release	Net Annual 'Carbon Uptake '(+) or Release (-)	Convert to CO_2'Annual Emission (-) or Removal (+)
	(kt C)	(kt dm)	(kt dm)	(kt C)	(kt C)	(Gg CO_2)
1994	15551.64	1868.25	-1827.25	-822.26	16373.90	60037.62
1995	16238.33	1880.15	-1859.35	-836.71	17075.04	62608.47
1996	16900.63	1891.70	-1866.40	-839.88	17740.51	65048.52
1997	17657.74	1885.40	-1846.15	-830.77	18488.51	67791.19
1998	18267.21	1885.05	-1846.25	-830.81	19098.02	70026.06
1999	18683.18	1875.95	-1834.95	-825.73	19508.91	71532.66
2000	19107.10	1867.90	-1822.30	-820.04	19927.14	73066.16
2001	19598.62	1866.15	-1827.95	-822.58	20421.20	74877.72
2002	19759.82	1833.25	-1791.35	-806.11	20565.92	75408.38
2003	20094.69	1859.85	-1807.05	-813.17	20907.86	76662.16
2004	20405.96	1879.45	-1808.45	-813.80	21219.76	77805.78
2005	21043.78	1875.25	-1807.75	-813.49	21857.27	80143.31
2006	21455.45	1882.25	-1811.55	-815.20	22270.64	81659.02

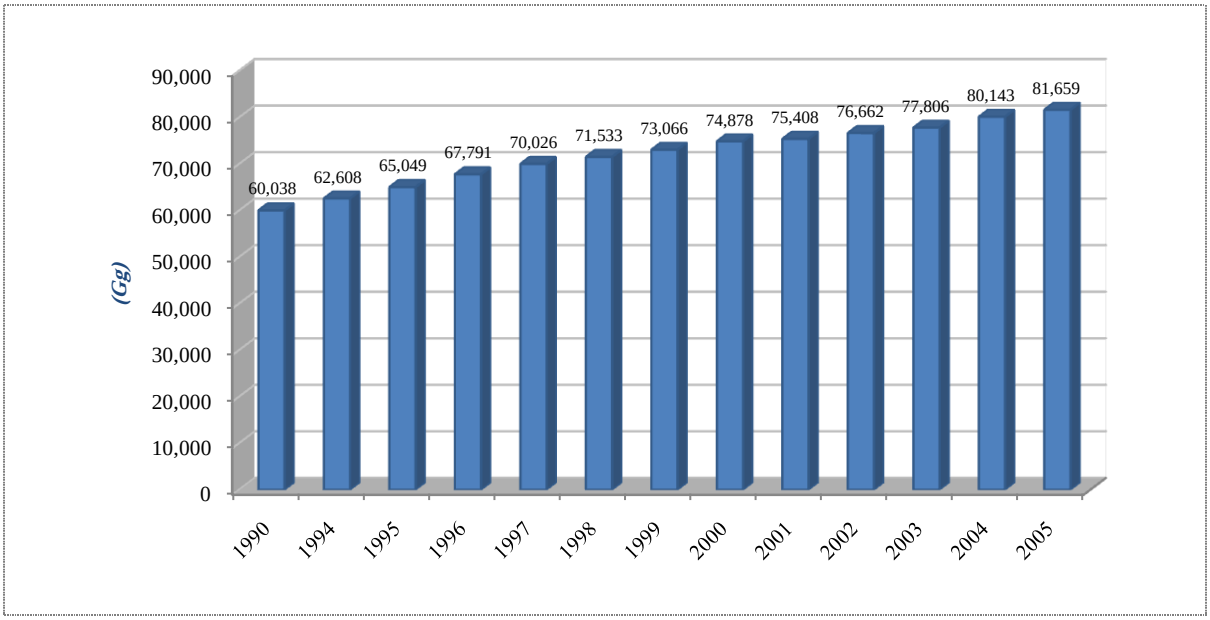

Fig (17) Changes in Forest and Other Woody Biomass Stocks

It is noticed that CO_2 stocks increased 20583 Kt in the period 1994-2006

- Forests and grasslands conversion – Co2 emission from Biomass

Table (19) Forests and grasslands conversion – Co2 emission from Biomass

years	**Annual Loss of Biomass**	**Quantity of Carbon Released (from biomass burned)**	**Quantity of Biomass Burned off Site**	**Quantity of Carbon Released (from biomass burned off site)**	**Total Carbon Released (from on and off site burning)**	**Carbon Released from Decay of Above-ground Biomass**	**Total Annual Carbon 'Release**	**Total Annual CO_2 'Release**
	(kt dm)	(kt C)	(kt dm)	(kt C)	(kt C)	(kt C)	(kt C)	(Gg CO_2)
1990								
1994	3736.50	840.71	1868.25	840.71	1681.43	2577.50	4258.93	15616.06
1995	3760.30	846.07	1880.15	846.07	1692.14	2577.50	4269.64	15655.33
1996	3783.40	851.27	1891.70	851.27	1702.53	2577.50	4280.03	15693.44
1997	3770.80	848.43	1885.40	848.43	1696.86	2577.50	4274.36	15672.65
1998	3770.10	848.27	1885.05	848.27	1696.55	2577.50	4274.05	15671.50
1999	3751.90	844.18	1875.95	844.18	1688.36	2577.50	4265.86	15641.47
2000	3735.80	840.56	1867.90	840.56	1681.11	2577.50	4258.61	15614.90
2001	3732.30	839.77	1866.15	839.77	1679.54	2577.50	4257.04	15609.13
2002	3666.50	824.96	1833.25	824.96	1649.93	2577.50	4227.43	15500.56
2003	3719.70	836.93	1859.85	836.93	1673.87	2577.50	4251.37	15588.34
2004	3758.90	845.75	1879.45	845.75	1691.51	2577.50	4269.01	15653.02
2005	3750.50	843.86	1875.25	843.86	1687.73	2577.50	4265.23	15639.16
2006	3764.50	847.01	1882.25	847.01	1694.03	2577.50	4271.53	15662.26

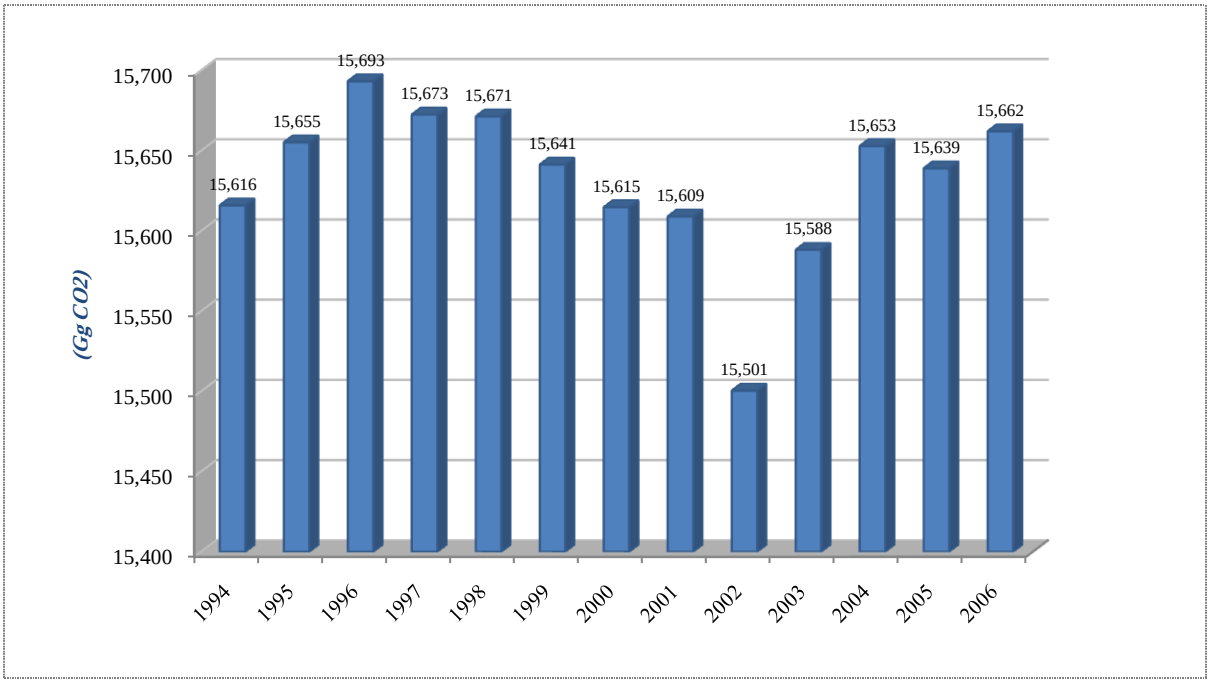

Fig (18) Total CO2 Annual Release from Forests and Grasslands Conversion

It is noticed that CO2 release increased 50 Kt in the period 1994-2006, in an annual increment about 5%

- Burning on Field:

Trace Gas Emissions from Burning of Cleared Forests except (CO2)

Table (20): Trace Gas Emissions from Burning of Cleared Forests except (CO2)

years	Quantity of Carbon Released	Trace Gas Emissions from Burning of Cleared Forests			
	(kt C)	CH_4	CO	N_2O	NO_x
		(Gg CH_4, CO)		(Gg N_2O, NO_x)	
1994	840.71	13.45	117.70	0.09	3.34
1995	846.07	13.54	118.45	0.09	3.36
1996	851.27	13.62	119.18	0.09	3.38
1997	848.43	13.57	118.78	0.09	3.37
1998	848.27	13.57	118.76	0.09	3.37
1999	844.18	13.51	118.18	0.09	3.36
2000	840.56	13.45	117.68	0.09	3.34
2001	839.77	13.44	117.57	0.09	3.34
2002	824.96	13.20	115.49	0.09	3.28
2003	836.93	13.39	117.17	0.09	3.33
2004	845.75	13.53	118.41	0.09	3.36
2005	843.86	13.50	118.14	0.09	3.35
2006	847.01	13.55	118.58	0.09	3.37

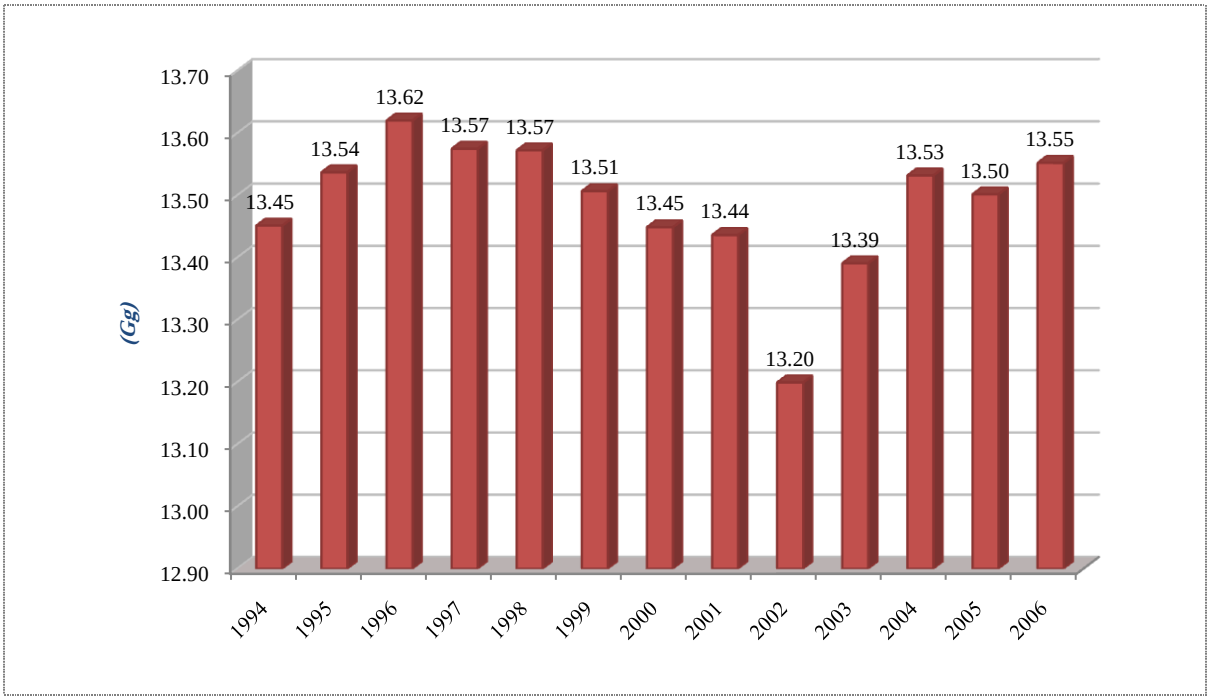

Fig (19) CH4 Emission from Burning Cleared Forests in 1994-2006

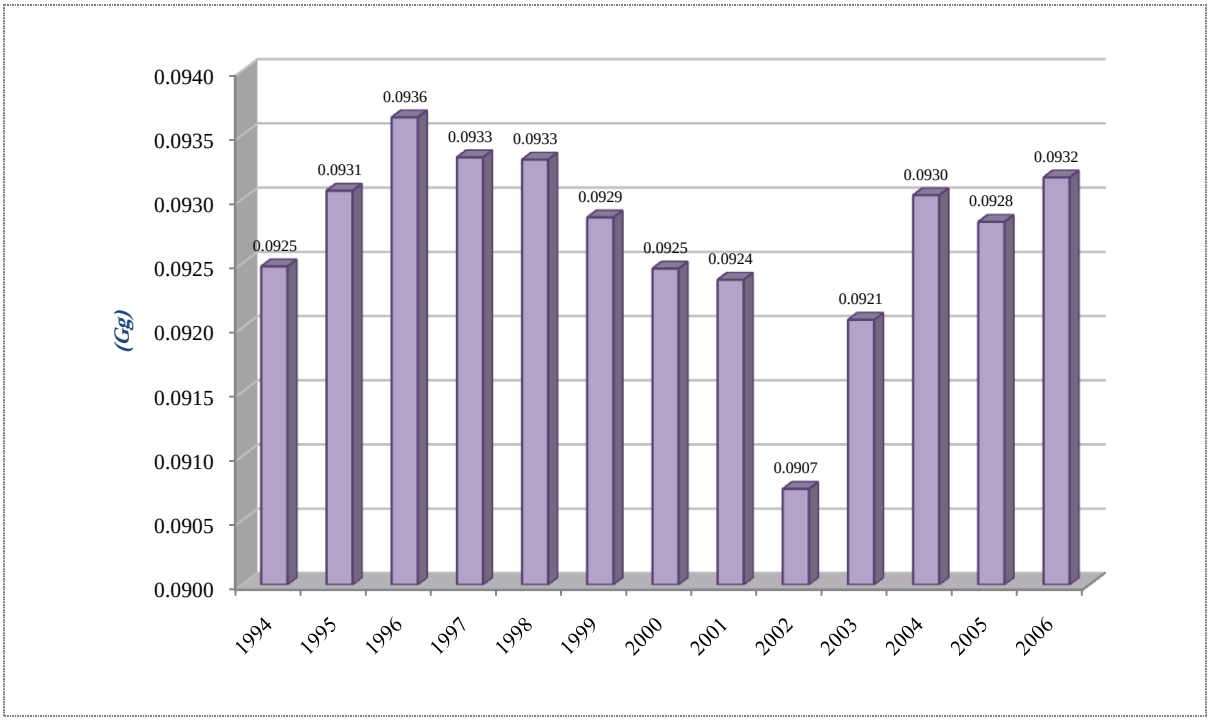

Fig (20) N_2O Emission from Burning Cleared Forests in 1994-2006

It is noticed that there are no considerable increment for CH4, N2O gases from burning cleared forests in 1994-2006.

➢ From Abandonment Lands

Table (21) Total Carbon Uptake and Total Carbon Dioxide Uptake from Abandonment Lands

Years	Annual Carbon Uptake in Aboveground Biomass FIRST 20 YEARS	Annual Carbon Uptake in Aboveground Biomass- > 20 YEARS	Total Carbon Uptake from Abandoned Lands	Total Carbon Dioxide Uptake
	(kt C)	(kt C)	(kt C)	(Gg CO_2)
1994	529.00	529.00	1058.00	3879.33
1995	520.75	520.75	1041.50	3818.83
1996	521.25	521.25	1042.50	3822.50
1997	519.63	519.63	1039.25	3810.58
1998	521.88	521.88	1043.75	3827.08
1999	521.88	521.88	1043.75	3827.08
2000	523.00	523.00	1046.00	3835.33
2001	530.88	530.88	1061.75	3893.08
2002	524.13	524.13	1048.25	3843.58
2003	532.00	532.00	1064.00	3901.33
2004	529.75	529.75	1059.50	3884.83
2005	493.75	493.75	987.50	3620.83
2006	511.75	511.75	1023.50	3752.83

It is noticed that there is no increment in Carbon Dioxide Uptake from abandonment lands in 1994-2006, but it decreased a little in this period.

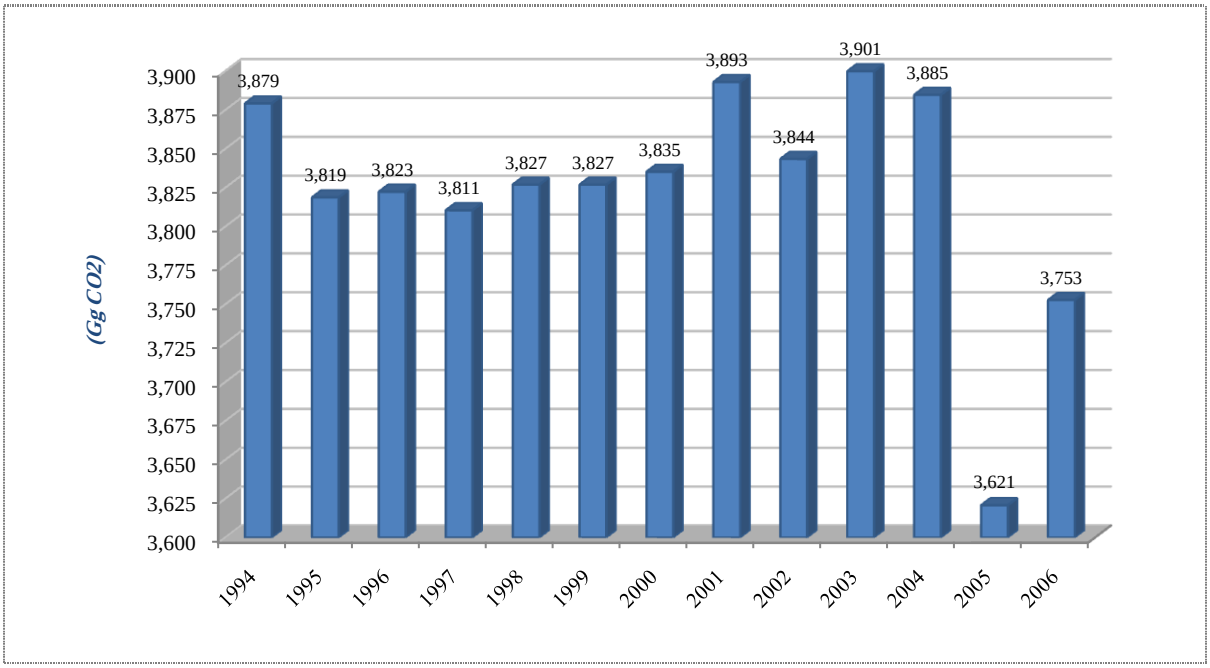

Fig (21) Total Carbon Dioxide Uptake from Abandonment Lands

➢ Changes in Soil Carbons in Mineral Soils

Table (22) Changes in Soil Carbons in Mineral Soils

years	Total Annual Carbon Emission in Mineral Soils	Total Annual Carbon Emission from Organic Soils	Total Annual Carbon Emission from Liming	Convert to Total Annual CO2 Emission in Mineral Soils	Convert to Total Annual CO2 Emission from Organic Soils	Convert to Total Annual CO2 Emission from Liming	Convert to Total Annual CO2 Emission
	(Gg)	(Gg)	(Gg)	(Gg/yr)	(Gg/yr)	(Gg/yr)	(Gg/yr)
1994	0	5000	315.36	0	18333.33	1156.32	19489.65
1995	0	5000	315.36	0	18333.33	1156.32	19489.65
1996	0	5000	315.36	0	18333.33	1156.32	19489.65
1997	0	5000	315.36	0	18333.33	1156.32	19489.65
1998	0	5000	315.36	0	18333.33	1156.32	19489.65
1999	0	5000	315.36	0	18333.33	1156.32	19489.65
2000	0	5000	315.36	0	18333.33	1156.32	19489.65
2001	0	5000	315.36	0	18333.33	1156.32	19489.65
2002	0	5000	315.36	0	18333.33	1156.32	19489.65
2003	0	5000	315.36	0	18333.33	1156.32	19489.65
2004	0	5000	315.36	0	18333.33	1156.32	19489.65
2005	0	5000	315.36	0	18333.33	1156.32	19489.65
2006	0	5000	315.36	0	18333.33	1156.32	19489.65

It is noticed that there is no increment in CO2 emission in the period 1994-2006

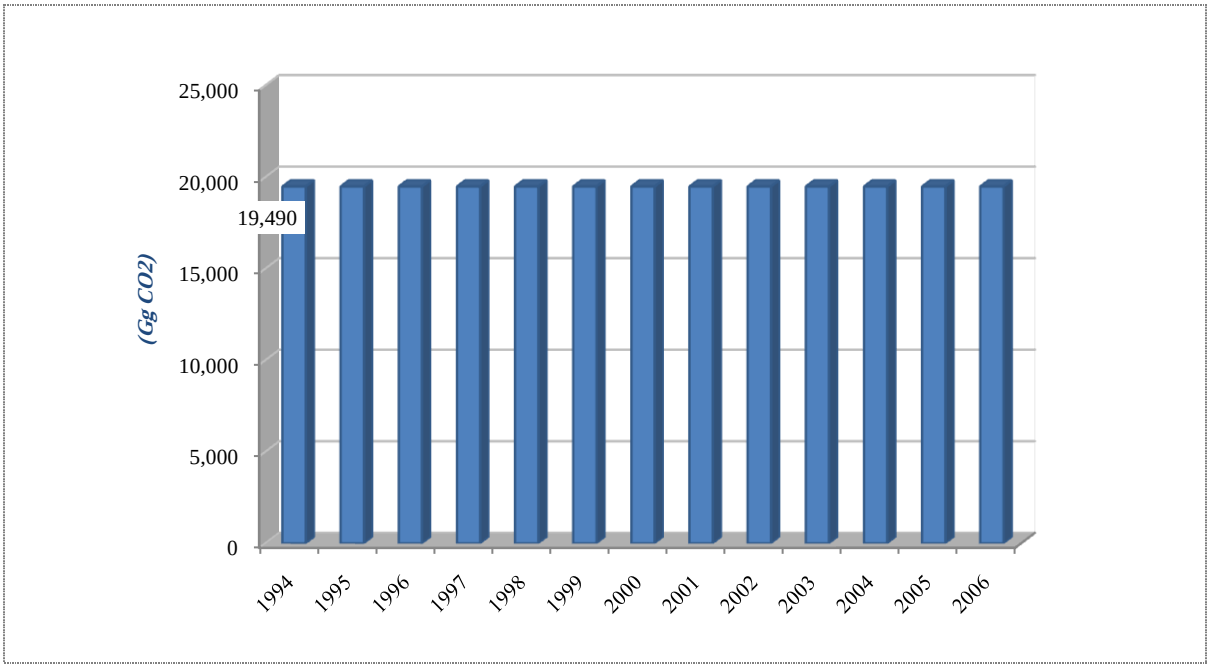

Fig (22) Changes in CO_2 Emissions from Mineral Soils

- Forests and Land use Emission and Removals

Table (23) Total Carbon Uptake from Forests and Land use

Years	Convert to CO2'Annual Emission (-) or Removal (+) in Woody Biomass	Total Carbon Dioxide Uptake in Abandonment lands	TOTAL UPTAKE
	(Gg CO2)	(Gg CO_2)	
1994	60037.62	3879.33	63916.96
1995	62608.47	3818.83	66427.30
1996	65048.52	3822.50	68871.02
1997	67791.19	3810.58	71601.78
1998	70026.06	3827.08	73853.15
1999	71532.66	3827.08	75359.74
2000	73066.16	3835.33	76901.50
2001	74877.72	3893.08	78770.81
2002	75408.38	3843.58	79251.97
2003	76662.16	3901.33	80563.50
2004	77805.78	3884.83	81690.61
2005	80143.31	3620.83	83764.15
2006	81659.02	3752.83	85411.86

It is noticed that the CO2 uptake increased about 21495 Gg in the period 1994-2006, in an annual increment about 7.7%

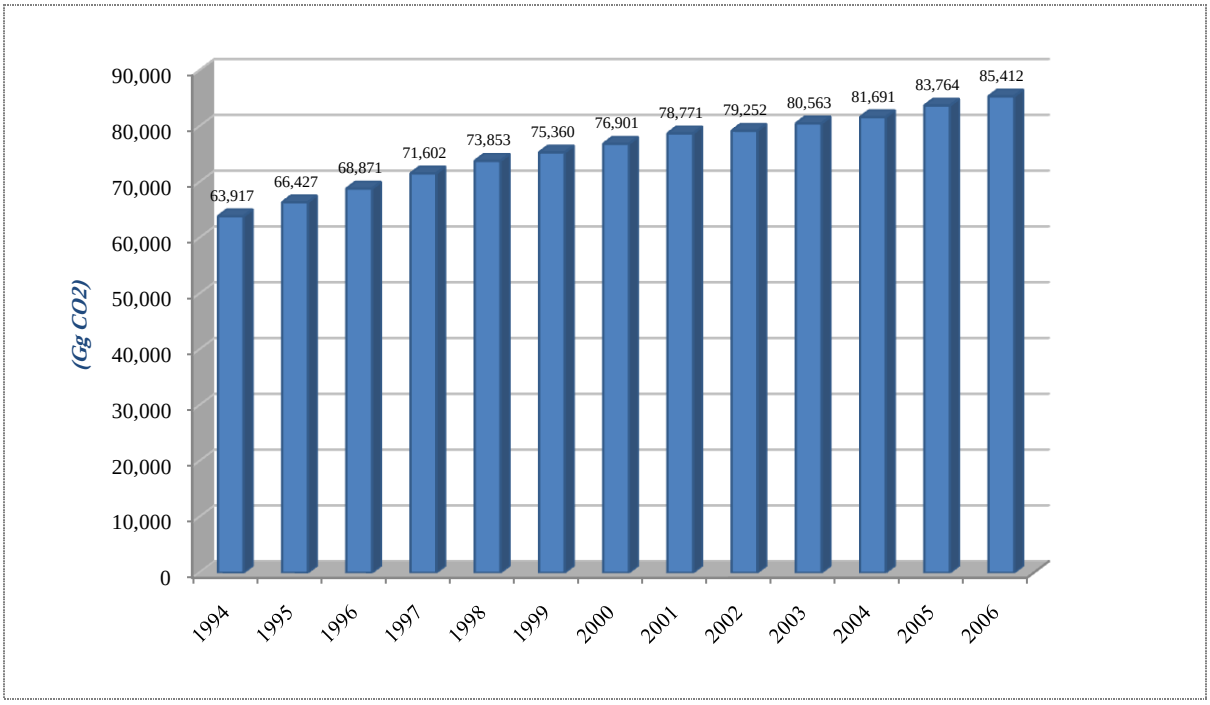

Fig (23) changes in CO_2 uptake from forest sector

- Total CO2 emissions

Table (24) Total Carbon Emission

Years	Total Annual CO_2 'Release FROM CONVERSION	CH_4 from burnng	CO2 EQ. to CH4 from forest	N_2O	CO2 EQ. toN2O from forest	Convert to Total Annual CO2 Emission from MINERAL SOILS	Total CO2 emissions from forest
	(Gg CO_2)	(Gg CH4)	(Gg/yr)	(Gg N2O)	(Gg/yr)	(Gg/yr)	
1994	15616.06	13.45	282.48	0.09	28.67	19489.65	35416.86
1995	15655.33	13.54	284.28	0.09	28.85	19489.65	35458.11
1996	15693.44	13.62	286.03	0.09	29.03	19489.65	35498.15
1997	15672.65	13.57	285.07	0.09	28.93	19489.65	35476.31
1998	15671.50	13.57	285.02	0.09	28.93	19489.65	35475.10
1999	15641.47	13.51	283.64	0.09	28.79	19489.65	35443.55
2000	15614.90	13.45	282.43	0.09	28.66	19489.65	35415.65
2001	15609.13	13.44	282.16	0.09	28.64	19489.65	35409.58
2002	15500.56	13.20	277.19	0.09	28.13	19489.65	35295.53
2003	15588.34	13.39	281.21	0.09	28.54	19489.65	35387.74
2004	15653.02	13.53	284.17	0.09	28.84	19489.65	35455.68
2005	15639.16	13.50	283.54	0.09	28.78	19489.65	35441.13
2006	15662.26	13.55	284.60	0.09	28.88	19489.65	35465.39

There is no increment for Co2 emission in the period 1996-2004

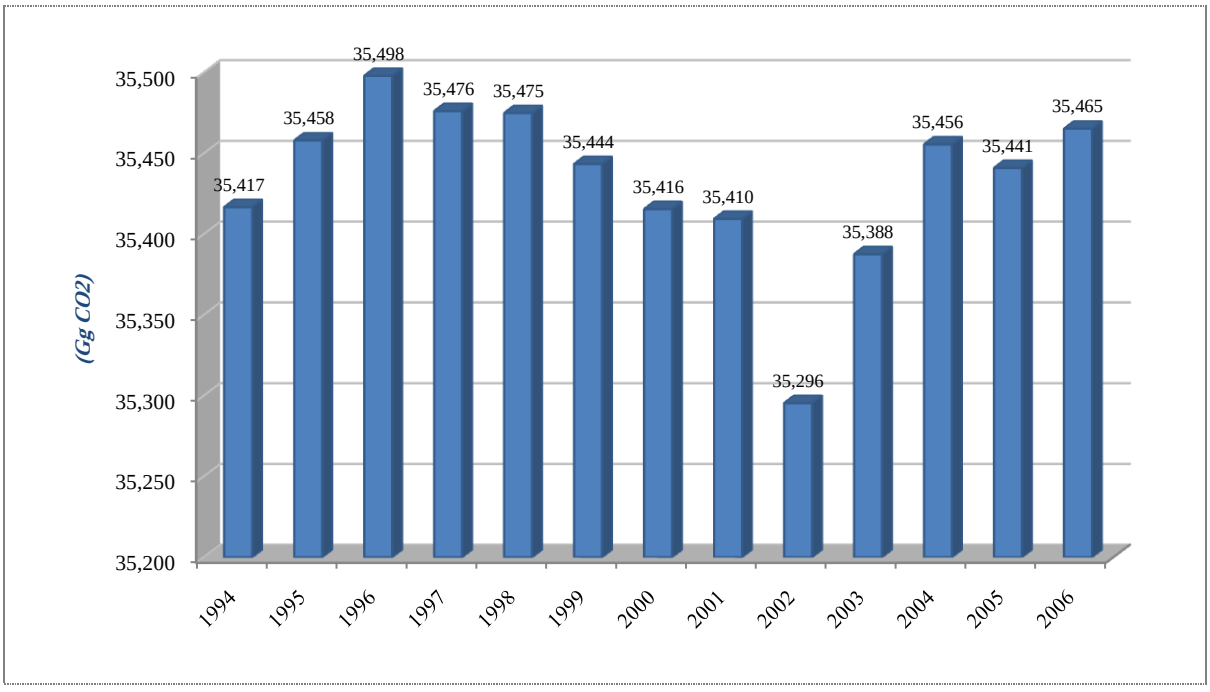

Fig (24) Total Carbon Emission from Forest Sector

5.4.3. Total Emission According to the Gas in the Agriculture, Forests and Land Use Sectors

- CH4 and N2O gases

Table (25) Total N2O and CH4 Emission from Agriculture, Forests and Land Use sectors

Years	Total ' CH_4 from agriculture	TotalN2O from agriculture	CH_4 from forest	N_2O from forest	Total CH_4	Total N2O
	(Gg)	(Gg)	(Gg CH_4)	(Gg N2O)	(Gg CH_4)	(Gg N2O)
1994	107.49	23.64	14.54	0.10	122.03	23.74
1995	116.04	25.86	14.63	0.10	130.68	25.96
1996	122.80	26.63	14.71	0.10	137.52	26.73
1997	127.61	26.52	14.67	0.10	142.28	26.62
1998	139.67	28.76	14.67	0.10	154.34	28.86
1999	128.34	27.35	14.60	0.10	142.94	27.45
2000	128.75	27.31	14.54	0.10	143.30	27.41
2001	121.91	23.83	14.53	0.10	136.44	23.93
2002	127.73	25.14	14.29	0.10	142.02	25.24
2003	139.92	28.79	14.48	0.10	154.40	28.89
2004	154.55	30.43	14.63	0.10	169.18	30.53
2005	168.62	33.96	14.60	0.10	183.22	34.06
2006	181.23	36.31	14.65	0.10	195.88	36.41

Total N2O emission increase about 1045 Gg in the period 1994-2006, in an annual increment about 7.7%, and CH4 increase in an annual increment about 7.7 %.

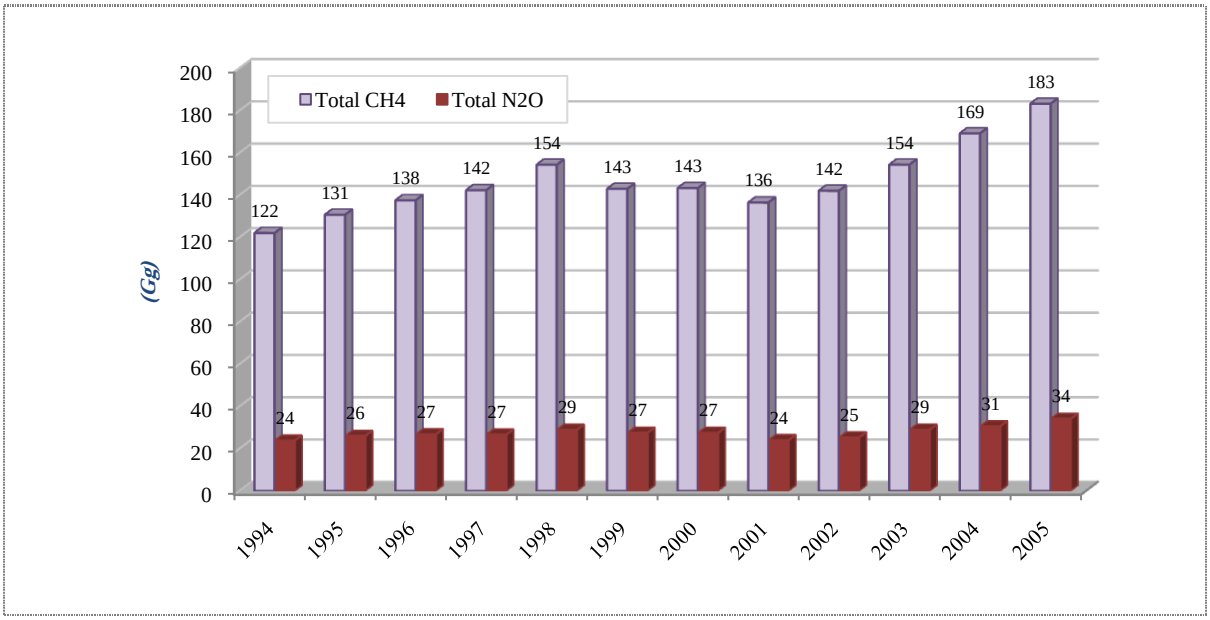

Fig (25) Total N_2O and CH4 Emission from Agriculture, Forests and Land use sectors

- Total CO2 from all sectors

Table (26) Total CO2 Uptake –Emission, Emission (-) or Removal (+) from Agriculture and Forest sectors

Years	Total CO2 FROM AGRICULTURE	CO2 TOTAL FROM FOREST	TOTAL CO2 EMISSIONS	TOTAL UPTAKE	TOTAL UPTAKE - EMISSION Emission (-) or Removal (+)
	(Gg)	(Gg)	(Gg)		
1994	9585.69	35416.86	45002.55	63916.96	18914.41
1995	10454.26	35458.11	45912.38	66427.30	20514.93
1996	10833.03	35498.15	46331.18	68871.02	22539.84
1997	10902.23	35476.31	46378.54	71601.78	25223.24
1998	11848.92	35475.10	47324.02	73853.15	26529.13
1999	11172.25	35443.55	46615.80	75359.74	28743.95
2000	11170.22	35415.65	46585.86	76901.50	30315.63
2001	9948.43	35409.58	45358.01	78770.81	33412.79
2002	10476.36	35295.53	45771.89	79251.97	33480.08
2003	11862.35	35387.74	47250.09	80563.50	33313.41
2004	12679.10	35455.68	48134.78	81690.61	33555.83
2005	14067.67	35441.13	49508.80	83764.15	34255.35
2006	15060.76	35465.39	50526.15	85411.86	34885.70

It is noticed that CO2 Uptake is increase about 15971.29 in an annual increment about 7.7%.

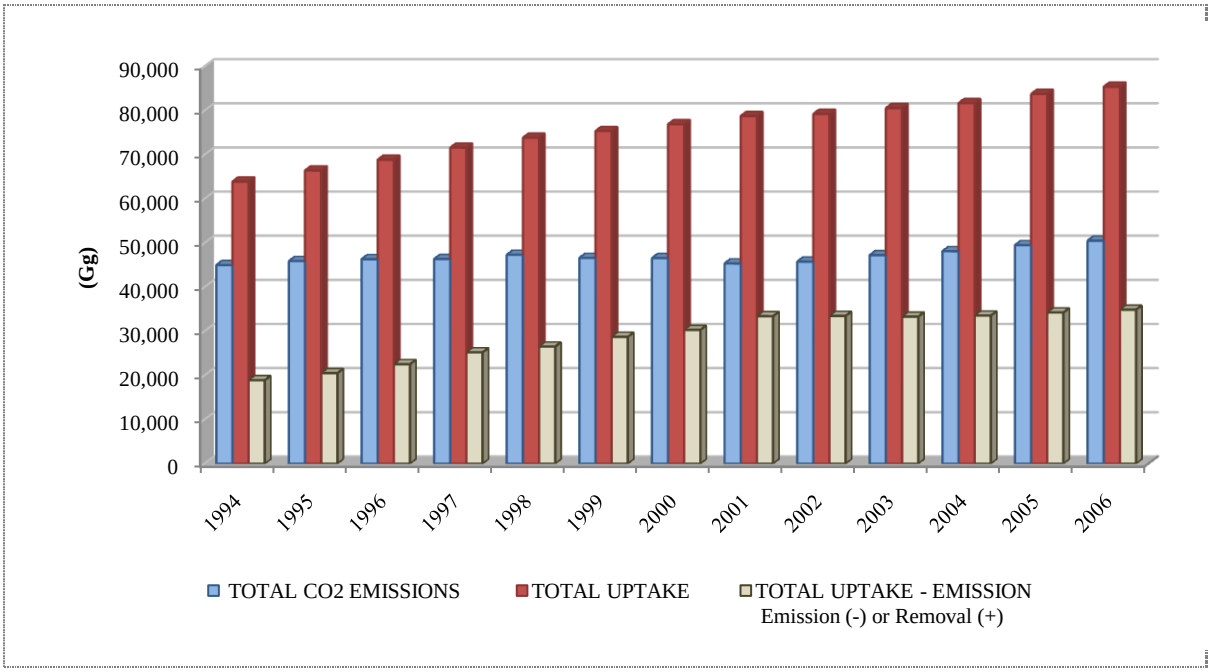

Fig (26) Total CO_2 Uptake-Emission from Agriculture and Forest Sectors

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