

Session 4: IPCC Inventory Software for National GHG inventories – New Functionalities in the AFOLU Sector

SBSTA - 56

8 June, 2022

Valentyna Slivinska – Sandro Federici IPCC TFI TSU



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Overview of elements upgraded

Land Representation Manager

- ✓ Mineral soil SOC change Equation 2.25
 - Formulation A
 - Formulation B

Stock Difference Method

Wetlands Supplement

- ✓ additional Methods
- ✓ additional Categories





Land Representation Manager (LRM)

- New Element of the IPCC Inventory Software
- It manages Land Representation allowing to use any of the three IPCC approaches:
 - >Approach 1 (no land use change identification)
 - >Approach 2 (land use change identification)
 - >Approach 3 (land use change identification and tracking across time)
- It ensures consistency of land representation through tracing of units of land,
- Unit of land: an area homogenous per
 - > physical conditions –*i.e. climate/vegetation zone and soil type-* and
 - > current and historical socio-economic functions -*i.e.* land use and management type-



LRM – Regions Tab

and Representation Manager			-	
Regions Land representation table Annual land represent	tation matrix (Approach 2 & 3)			
/hole country area (ha) 19,000.000				
Region name	Area (ha)	Approach	Remark	
Region 3	And the second se	Approach 3		
Region 1		Approach 1		
Region 2	1000	Approach 2		
K				
otal	19000.000			
	1007			
fine single region in case you wish to report for the whole count	try			
efine single region in case you wish to report for the whole count	try		Save Undo	Close

- A country can be represented in a single set of National data or in a number of Regions
- For each Region the approach applied for the land representation is to be selected



egions	Land	representation table	Annual land	representation matrix (Appr	roach 2 & 3)								_	
egion	Regi	on 3	~	Region area (ha)	17,100.000	Discrepa	ncy (ha) OK			Approach	3		19	99
			and use cate	gory			Area (1990) (ha)				Remark			
► F	orest Li	and						14	100					_
				e subcategory			Area (1990) (ha)				Remark			
	Mana	aged Forest Land							14100					
				Current Land use	e subdivision					1	Remark			l
E	- N	lanaged Forest												
		Land unit co (Automatic)		Land unit code (User defined)	Previous Li subcate		Previous Land use subdivision	Tran	isition period [T] (years)	Year of conversion	Area (1990) (ha)	Remark	PC	м
	œ.	MFL-MF-NF-OB-1	0<-UFL-P_	Unit 1.1	Unmanaged For	rest Land	Protected area	20		1990	1000 💮		2	ľ
		MFL-MF-NF-OB-1	8<-OSL-A	Unit 6	Settlements (Ot	her)	Abandoned	20		1990	1000 💮		2	1
	±	MFL-MF-NF-OB-2	1<-ACL-A		Cropland Annua	I Crops	Annual Crops	20		1981	100		30	
	*	ŧ				~	~				(··)		2	
				Current Land use	e subdivision						Remark			
E	3- N	lanaged Forest (draine	ed)											
Œ		lantation (intensive)												
G	P	lantation						_						_
	*							~						
				e subcategory			Area (1990) (ha)				Remark			
Đ	Unm	nmanaged Forest Land							0					1
		Land use category					Area (1990) (ha)				Remark			
	ropland								500					
	irasslar	505255							500					_
	/etlands	<u> </u>							0					_
	ther La								0					-
														-

- All info on land use and land use changes is to be input in this Tab
- A Table for each Region
- Automatic check of area discrepancy





Pagine Land representation makin (Approach 2 & 3.) Pagine Region Region Region Approach 3 Image Land use category (100) Discrepancy (hz) Approach 3 Image Forest Land Land use subcategory (100) Remark Image Current Land use subcategory (100) Remark Image Forest Land Image Trainsition pation Remark Image Current Land use subcategory (100) Remark Trainsition pation Remark Imaged Current Land use subcategory Remark Trainsition pation Remark Remark Imaged Current Land use subcategory (100) Remark Remark Remark Imaged Current Land use subcategory Remark Trainsition pation Remark Imaged Forest Land Imaged Forest Land Remark Remark Imaged Current Land use subcategory (190) Remark Imaged Current Land use subcategory (190) Remark Imaged Current Land use subcategory (190) Remark											
egion	Reg	gion 3 🗸 🗸 🗸	Region area (ha)	17,100.000	Discrepa	ncy (ha) OK		Approact	3		199
			ategory			(1990)			Remark		
► Fo	orest	Land					14100				
			use subcategory			(1990)			Remar		
¢.	Mar	naged Forest Land					14	100			
	_		Current Land use	subdivision					Remark		
•	-	Managed Forest				1	1	1			
								Tear or	(1990)	Remark	P C M
	æ		- Unit 1.1	Inmanaged Fore	est Land	Protected area	20	1990	1000 💮		2
	٠		- Unit 6	ettlements (Oth	ner)	Abandoned	20	1990	and an and a second sec		2
	æ	MFL-MF-NF-OB-21<-ACL-A.	-	ropland Annual	Crops	Annual Crops	20	1981			ق 🗹
	L.,				~	~			(··)		2
			Current Land use	subdivision					Remark		
	*	Tunuau					~				
					1	Árag					
			use subcategory			(1990)			Remar		
	Unr	managed Forest Land				(114)		0			
						Area					
			ategory						Remark		
C	roplar	nd			_		2500				
_							0000				
	172.5	77.									
		anu		5			U				

- Each unit of land gets assigned a code from the software on the basis of current and previous land use/management
- To ease the work of inventory compilers, an additional user defined code can be assigned to each unit of land



		representation table		d representation matrix (Appr									
egion	Regi	ion 3	~	Region area (ha)	17,100.000	Discrepa	ancy (ha) OK		Approach	3		19	190
		(Land use cate	egory			Area (1990) (ha)			Remark			
Fo	orest L	and						14100					
			Land us	e subcategory			Area (1990) (ha)			Remar	k		
0	Man	aged Forest Land						14100)				_
				Current Land use	subdivision					Remark			
Ē		Managed Forest			7								
		Land unit c (Automati		Land unit code (User defined)	Previous I subcat		Previous Land use subdivision	Transition pe [T] (years)	riod Year of conversion	Area (1990) (ha)	Remark	PCN	м
	Ð	MFL-MF-NF-OB	and the second second second second	Unit 1.1	Unmanaged Fo	orest Land	Protected area	20	1990	1000 💮		2	
	Đ	MFL-MF-NF-OB		Unit 6	Settlements (C		Abandoned	20	1990	1000 💮		2	
		MFL-MF-NF-OB	-21<-ACL-A		Cropland Annu	al Crops	Annual Crops	20	1981	100 💮		70	
	-	*				~				{·· }		2	
				Current Land use	sudivision					Remark			
æ		Managed Forest (dra	ined)					_					_
Đ		Plantation (intensive) Plantation	8					_					-
Đ	- F	lantation						~					-
	*					1			-				
			Land us	e subcategory			Area (1990)			Remar			
Đ	Ung	anaged Forest Land					(ha)	0					
			3			5	Area		1				
			Land use cate	egory			(1990) (ha)			Remark			
Cr	roplan	d					(na)	2500					<u> </u>
1000	rassla							500					_
	etland	<u> </u>						0					
_	ettleme							0					_
O	ther La	bnd						0					_

- Each unit of land is to be input in the software on the basis of current and previous land use/management
- Data input in the time series is to be done from its first year forward



pions	Land r	epresentation table Annual la	nd representation matrix (Appr	oach 2 & 3)								
gion	Regio	on 3 🗸 🗸 🗸	Region area (ha)	17,100.000	Discrepa	ancy (ha) OK	16	Approach	3		19	99
		Land use ca	tegory			Area (1990) (ha)			Remark			
▶ Fo	orest La	and					14100					
			se subcategory			Area (1990) (ha)			Remar			
0	Mana	ged Forest Land					14	100				_
			Current Land use	subdivision					Remark			
e	м	anaged Forest										_
		Land unit code (Automatic)	Land unit code (User defined)	Previous L subcate		Previous Land use subdivision	Transition [T] (year	conversion	Area (1990) (ha)	Remark	PC	
	.	MFL-MF-NF-OB-10<-UFL-P_	Unit 1.1	Unmanaged Fo	rest Land	Protected area	20	1990	1000 💮		2	
		MFL-MF-NF-OB-18<-OSL-A_	Unit 6	Settlements (O	ther)	Abandoned	20	1990	1000 «->		2	1
		MFL-MF-NF-OB-21<-ACL-A		Cropland Annu	al Crops	Annual Crops	20	1981	100 ↔		30	
	*	ŧ			~	J			(··)		2	
			Current Land use	subdivision					Remark			
۲	M	anaged Forest (drained)										
۲	102	lantation (intensive)										_
Œ	PI	lantation					_					_
	*						~					
			se subcategory			Area (1990) (ha)			Remar			
Đ	Unma	anaged Forest Land						0				
		Land use ca	tegory			Area (1990) (ha)			Remark			
225	opland						2500					
22220	rasslan						500					_
	etlands						0					_
	ther La						0					-
				2								-

- For each conversion: Transition Period and Conversion Year are to be input
- Once input in an inventory year, the unit of land is copied by the software in all years of the time series updating its "conversion-status" according to the time passed since its conversion



	Land unit code (Automatic)	Land unit code (User defined)	Previous Land use subcategory	Previous Land use subdivision	Transition period [T] (years)	Year of conversion	Are (199 (ha		Remark	РС	м	
	MFL-PP-PL-P-4<-MGL-P-P	Approccio 3 esempio	Managed Grassland	Pasture	20	1984	1000	<·· >		10		۲
*			~	~				(··)		2		
												_

Additional functionalities

• Area entry: once area of a unit of land is input the user may select the portion of the time series to which that are is to be assigned to the unit

Area update mode	×
O Current inventory year only	
 Current inventory year and all subsequent inventory years 	
O Current inventory year and all previous inventory years	
O All inventory years	
Update	Cancel

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

• By default, the area is assigned to the current and subsequent years



Land unit code (Automatic)	Land unit code (User defined)	Previous Land use subcategory	Previous Land use subdivision	Transition period [T] (years)	Year of conversion	Area (1991) (ha)	Remark	PC	м
MFL-PP-PL-P-4<-MGL-P-P	Approccio 3 esempio	Managed Grassland	Pasture	20	1984	1000 ↔		30	×
*		~	~			(··)		2	

Additional functionalities

• Button "P" (Pools) to assign to each C pool the method to estimate C stock changes i.e. IPCC default method vs Stock-Difference method

Land Unit Parameters		\times
C pools / Methods		
Biomass change	Gain & Loss 🛛 🗸 🗸	
DOM - Deadwood	Gain & Loss 🛛 🗸 🗸	
DOM - Litter	Gain & Loss 🛛 🗸 🗸	
SOM - Mineral	Default ~	
	Save Cancel	



INTERGOVERNMENTAL PANEL ON Climate change

DCC

Cropland									_	-
Land use	subcategory		Area (ha)			Remark				
Cropland annual crops		θ								
	Current Land use s	ubdivision			Rema	rk				
Organic 1 (A) rewetted								_		J
Land unit code (Automatic)	Land unit code (User defined)	Previous Land use subcategory	Previous Land use subdivision	Transition period [T] (years)	Year of conversion	Area (ha)	Remark	P	с	м
ACL-01AR-104<-MFL		Managed Forest land	Tectona grandis NF	20	1990	100 000		-	Ö	

Additional functionalities

• **Button** "**C**" (Conversion) to input a further conversion to a unit of land that is still undergoing a conversion (*no 20-year period passed since the previous conversion*)

From	Managed Fore	est land / Tectona gra	ndis NF	
То	Cropland annu	ial crops / Organic 1 (A) rewetted	
Transition period	20	Year of conversi	on 1990	
Land use subdivision	Settle	ement 1 (T)		v
Transition period		20		
Year of conversion	1995	i v		
Remark				



It is available in Approach 3 land representation only

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

	Land use s	ubcategory			Area (1991) (ha)			Remark			
Mana	aged Forest Land					120					
		Current Land use	subdivision				Ren	nark			
Pi	ine plantation									•	
	Land unit code (Automatic)	Land unit code (User defined)	Previous L subcate		Previous Land use subdivision	Transition period [T] (years)	Year of conversion	Area (1991) (ha)	Remark		м
.	MFL-PP-PL-P-23		Managed Fores	t Land	Pine plantation	NA	NA	100 💮			
.	MFL-PP-PL-P-24<-MGL-P-P		Managed Grass	sland	Pasture	20	1990	10 💮			
H	MFL-PP-PL-P-25		Managed Fores	t Land	Pine plantation	NO	NO	10 <>			C

Additional functionalities

• **Button** "**M**" (Merge) to merge a unit of land that has completely undergone through the transition period.

Merging is allowed with any other unit with identical land use (category/subcategory/subdivision) as well as with identical climate/vegetation zone and soil type.

Land use subcategory	Managed Forest Land	
Land use subdivision	Pine plantation	
Land unit	MFL-PP-PL-P-25	
Area [ha]	10	
Target Land Unit Land use subcategory	Managed Forest Land	
Land use subdivision	Pine plantation	~
Land unit	MFL-PP-PL-P-23	
Area [ha]	100 +10 [ha]	



It is available in Approaches 2 and 3 land representation only

LRM – Example – Approach 3

Land Representation of 3 units of land tracked across 1989-2009

UL	Tracking info		REA (ha entory y	-
	[FL - Forest Land; GL – Grassland]	2000	2008	2009
	FL - Forest Plantation (from Managed FL in 1989):			
7.1	a) In 2008, half unit of land is converted to UL7.3;	3,000	1,500	0
	b) In 2009, remaining portion is merged with UL7.2;			
7.2	Forest Plantation (for any known years)	5,000	5,000	6,500
7.3	GL from 2008, from conversion of a portion of UL7.1	0	1,500	1,500
	Total area of Land Representation	8,000	8,000	8,000



LRM – EXAMPLE – Approach 3 – 2000 **First data input**

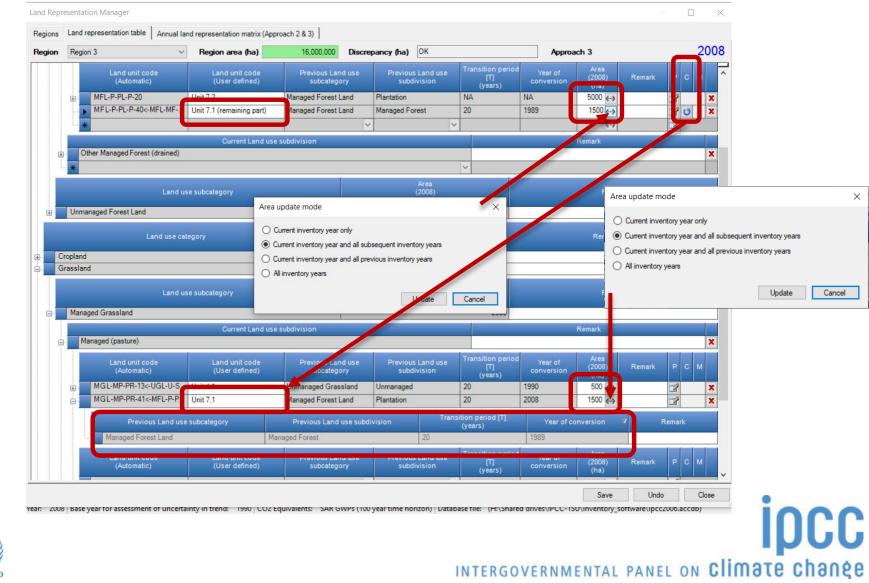
ons		representation table		d representation matrix (App											
on	Regio	on 3	~	Region area (ha)	16,0	00.000	Discrepancy (ha) ок			Approa	ch 3			20
			and use cate	gory			Are (200 (ha	D)				Remark			
Fo	orest La	and							13000						
			Land use	subcategory				Area (2000) (ha)				Remar	ĸ		
3	Mana	iged Forest Land							13	000					_
				Current Land use	e subdivision	1						Remark			
Ð		anaged Forest													×
Ð	_	anaged Forest (draine	ed)												2
(lantation (intensive)													>
P	PI	lantation								-					>
		Land unit coo (Automatic)		Land unit code (User defined)	ious Land i ubcategory		ous Land use bdivision	Transition [T] (years		Year of nversion	Area (2000) (ha)	Remark	PCN	Л	
	.	MFL-P-PL-P-20		Unit 7.2		Forest Lan		1/	NA	NA		5000 ↔		2	×
	Đ -	MFL-P-PL-P-41<-N	IFL-MF-	Unit 7.1	Managed	Forest Lan	nd Managed	Forest	20	1989	N.	3000 ↔		2	×
	*	•					× ×					(··)		2	
				Current Land use	1						Remark				
Đ	0	ther Managed Forest	(drained)						_						×
	*							~							
			Land use	subcategory			Area (2000) (ha)				Remar				
3-	Unma	anaged Forest Land							0						
		L	and use cate	gory			Area (2000) (ha)					Remark			
_	opland						2500								
	asslan								500						
	etlands ettlemer								0						
-	ttiemer								0						





LRM – EXAMPLE – Approach 3 – 2008

Splitting (new Input) and Conversion of the Unit of Land





LRM – EXAMPLE – Approach 3 – 2008

Conversion Tab used for Unit 7.1

Land Re	presentation Manager		New Land Unit Conversion	ı					×		— 🗆 🗙
Regions	Land representation table	Annual land repres	Current conversion status						-		
Region	Region 3	 Regi 	From Ma	naged Forest	Land / Ma	naged Forest				bach 3	2008
	L	and use category		naged Forest	Land / Pla				5	Remark	
	Forest Land		Transition period 20		Year of	conversion 1989					
	Managed Forest Land	Land use subca	New conversion to Land use subcategory	Manag	ed Grasslar	nd				Remark	
e	Managed Forest Land	_	Land use subdivision					1	-	Remark	
	Managed Forest		Transition period	Manag	ed (pasture 20)					×
	Managed Forest (draine	ed)	Year of conversion	2008	~						X
	Plantation (intensive)		rear of conversion	2008	× .						X
	Plantation		Remark								×
	Land unit coo (Automatic)					Save	Cancel	Year of nversio		Remark P C M	
	+ MFL-P-PL-P-40<-	MFL-MF Unit 7.1	(remaining part) Mana	aged Forest I	Land	Managed Forest	20	0	1989	1500 💨	2 U X
	*				~		~			<i>()</i>	
			Current Land use subdivis	sion						Remark	
	Other Managed Forest	(drained)									×
	*						~				
		Land use subcat	egory			Area (2008) (ha)				Remark	
Đ	Unmanaged Forest Land						0				
	L		Area (2008) (ha) 2500						Remark		
	Cropland										
	Grassland Vetlands				2000						
	Settlements				0						
	Other Land				0						
										Save	Undo Close



LRM – EXAMPLE – Approach 3 – 2007 Adjustment of UL area in the previous inventory year

Managed Forest (drained) Plantation (intensive) Plantation (intensive) Plantation Plantation Plantation Land unit code (Automatic) Land unit code (User defined) Previous Land use subdivision Transition period (Year of Conversion (Aab) Area (2000) (ha) Remark P C M MFL-P-PL-P-20 Unit 7.2 Managed Forest Land Plantation NA NA 5000 (**) T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T T <td< th=""><th>Land use category COOD (ha) Remark Forest Land Aria (2000) (ha) Remark Managed Forest Land Current Land use subdivision Remark Managed Forest (drained) Remark Plantation (Muse subdivision Remark Managed Forest (drained) Remark Plantation (Muse subdivision Remark Managed Forest (drained) Remark Plantation (Muse subdivision Remark Muse (Muse subdivision) Remark Managed Forest (drained) Remark Muse (Muse subdivision) Remark</th><th>on</th><th>Region</th><th>n 3</th><th>~</th><th>Region area (ha)</th><th>16,000.000</th><th>Discret</th><th>bancy (ha)</th><th>OK</th><th></th><th></th><th>Аррго</th><th>ach 3</th><th></th><th></th><th>_ 2</th><th>200</th></td<>	Land use category COOD (ha) Remark Forest Land Aria (2000) (ha) Remark Managed Forest Land Current Land use subdivision Remark Managed Forest (drained) Remark Plantation (Muse subdivision Remark Managed Forest (drained) Remark Plantation (Muse subdivision Remark Managed Forest (drained) Remark Plantation (Muse subdivision Remark Muse (Muse subdivision) Remark Managed Forest (drained) Remark Muse (Muse subdivision) Remark	on	Region	n 3	~	Region area (ha)	16,000.000	Discret	bancy (ha)	OK			Аррго	ach 3			_ 2	200
Land use subcategory Area (2000) (h) Remark Managed Forest Land 13000 Managed Forest (arained) 2 Plantation (intensive) 2 Plantation (intensive) 2 Plantation (intensive) 2 Managed Forest (arained) 2 MELP-PL-PA-0C-MFL-MF- Unit 7.1 (remaining part) Managed Forest (arained) 2 Current Land use subcategory 2 Current I wertory year only 2 Current invertory year only 2 Cur	Land use subcategory Area (2000) (ha) Remark Managed Forest Land Current Land use subdivision Remark Managed Forest Remark Managed Forest Remark Partiation (intensive) Remark Remark Remark Managed Forest (drained) Remark MELP-PLP-43C MEL-MFL Unit 7.1 Managed Forest Land Managed Forest Land Managed Forest (drained) Remark MELP-PL-P-41C-MEL-MFL Unit 7.1 Managed Forest Land Managed Forest 20 Other Managed Forest (drained) Remark Current Nettory year ond al previous invertory years Current Nettory year ond al subsequent invertory years Current Nettory years Undrase category			La	nd use cate	egory			(2000)					Remark				
Land use subcategory (2000) (ha) Remark Managed Forest Land 13000 Managed Forest Land 13000 Managed Forest (drained) Plantation (intensive) Plantation (intensive) Plantation (intensive) Plantation (intensive) Plantation (intensive) Managed Forest (drained) Vest of (Vest of (Ves	Land use subcategory (2000) (ha) Remark Managed Forest Land Current Land use subcition Remark x Managed Forest (drained) x x x Plantation (intensive) x x x Managed Forest (drained) x x x Managed Forest (drained) x x x Plantation (intensive) x x x Managed Forest (drained) x x x Mint code (User defined) x x x x Managed Forest (drained) x x x x Mint code (User defined) x x x x x Mint code (User defined) x Managed Forest 20 1989 x x Mint code (User defined) x x x x x x Mint code (User defined) x x	F	orest La	nd							13000							
Current Land use subdivision Remark Managed Forest Managed Forest (drained) Partation (intensive) Partation (intensive) Plantation (intensive) Previous Land use subdivision Transition period (years) Year of (2000) (years) Area (2000) (years) Remark P C M MELP-PLP-20 Unit 7.2 Managed Forest Land Previous Land use subdivision Transition period (years) Year of (2000) Area (2000) Remark P C M MELP-PLP-20 Unit 7.2 Managed Forest Land Managed Forest 20 1989 0.453 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0 <	Current Land use subdivision Remark Managed Forest X Managed Forest X Plantation X Multi code (Automatic) Land unit code (User defined) Previous Land use subcategory Transition period (users) Cerrent Land use subcategory Previous Land use subcategory Transition period (user set) Area (users) Area (Land use	e subcategory				(2000)				Rema	rk			
Managed Forest 2 Managed Forest (drained) 2 Plantation (intensive) 2 Plantation (intensive) 2 Plantation (intensive) 2 Managed Forest (dual unit code (dual unit code (dual unit code) Land unit code (dual unit code) Previous Land use subdivision Transition period (rest) Year of (ron version (rest) Area (2000) Remark P c M MELP-PLP-20 Unit 7.2 Managed Forest Land Plantation NA NA S000 ↔ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 <t< td=""><td>Managed Forest Managed Manag</td><td></td><td>Manag</td><td>ged Forest Land</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td>3000</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Managed Forest Managed Manag		Manag	ged Forest Land							1	3000						
Image of Forest (drained) Image	Image Forest (drained) X Plantation (intensive) X Plantation (intensive) X Plantation (intensive) X Plantation (intensive) X Image Forest (drained) Previous Land use subcategory Image Forest Land Plantation Image Forest Land Previous Land use subcategory Image Forest Land Plantation Image Forest Land Plantation Image Forest Land Plantation Image Forest Land Managed Forest Land Image Forest Land Managed Forest Cand Image Forest Land Minertory year and al absequent invertory years Image Forest Land Minertory year and al absequent invertory years Image Forest Land Minertory years Image Forest Land Miner					Current Land use	subdivision							Remark				
Plantation (intensive) Plantation (intensive) 2 Plantation 2	Plantation (intensive) Plantation X Plantation Land unit code (Automatic) Land unit code (User defined) Previous Land use subcategory Previous Land use subcategory Transition period (years) Year of conversion (na) Area (2000) (na) Remark P C M W MFL-P-PLP-20 Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 200 (4) 27 X W MFL-P-PLP-40-CMFL-MF- Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 200 (4) 27 X W MFL-P-PLP-40-CMFL-MF- Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 200 (4) 27 X Other Managed Forest Land Managed Forest Land Managed Forest and Managed Forest and Area update mode X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X </td <td>ŧ</td> <td>10000</td> <td></td>	ŧ	10000															
Plantation 2 Land unit code (Automatic) Land unit code (User defined) Previous Land use subcategory Previous Land use subcategory Transition period rouversion Year of conversion Area (2000) Remark P C M Imaged Forest Land Plantation NA NA NA Status P C M Imaged Forest Land Plantation NA NA NA Status P C M Imaged Forest Land Plantation NA NA NA Status P C M Imaged Forest Land Managed Forest Land Managed Forest 20 1989 Imaged Forest P C M Imaged Forest Land Managed Forest Land Managed Forest 20 1989 Imaged Forest P C Imaged Forest P C M P C M P C M P C Imaged Forest P C Imaged Forest P C Imaged Forest C Imaged Forest P C Imaged Forest P C Imaged Forest	Plantation X Land unit code (Automatic) Land unit code (User defined) Previous Land use subcategory Previous Land use subcategory Previous Land use subcategory Previous Land use subcategory Year of (rear) Area (2000) (rear) Remark P C M 0 MFL-P-PL-P-20 Unit 7.2 Managed Forest Land Plantation NA NA 5000 (c) Imaged Forest Imaged Forest 20 1989 Imaged Forest Imaged Forest 20 1989 Imaged Forest Imaged Forest Imaged Forest Imaged Forest 20 1989 Imaged Forest Imaged<				d)													
Land unit code (Automatic) Land unit code (User defined) Previous Land use subdivision Transition period (years) Area conversion (years) Area (2000) (ha) Remark P C M MFL-P-PL-P-20 Unit 7.2 Managed Forest Land Plantation NA NA 5000 (+) Imaged Forest Land Imaged Forest 20 1989 0 (+) Imaged Forest Imaged Forest 20 1989 0 (+) Imaged Forest Imaged Forest Imaged Forest 20 1989 0 (+) Imaged Forest Imaged Forest Imaged Forest 20 1989 0 (+) Imaged Forest Imaged Forest Imaged Forest Imaged Forest Imaged Forest 20 1989 0 (+) Imaged Forest Imaged Forest <td>Land unit code (Automatic) Land unit code (User defined) Previous Land use subcategory Previous Land use subcategory Previous Land use subcategory Transition period (years) Area conversion Area (2000) Remark P C M B MFLP-PL-P-20 Unit 7.2 Managed Forest Land Plantation NA NA NA S000 (*) If X MFLP-PL-P-40 Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 0.63 If X MFLP-PL-P-41 Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 0.63 If X Current Land use subdivision Current Land use subdivision Area update mode X If X If X If X If X If If X If If X If</td> <td></td> <td></td> <td>7</td> <td></td>	Land unit code (Automatic) Land unit code (User defined) Previous Land use subcategory Previous Land use subcategory Previous Land use subcategory Transition period (years) Area conversion Area (2000) Remark P C M B MFLP-PL-P-20 Unit 7.2 Managed Forest Land Plantation NA NA NA S000 (*) If X MFLP-PL-P-40 Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 0.63 If X MFLP-PL-P-41 Unit 7.1 (remaining part) anaged Forest Land Managed Forest 20 1989 0.63 If X Current Land use subdivision Current Land use subdivision Area update mode X If X If X If X If X If If X If If X If			7														
Land billic code (Automatic) Land billic code (User defined) Periods Land use subclategory Periods Land use subclategory Periods Land use subclategory Periods Land use (years) Conversion (years) Remark P C M Image Forest Land Managed Forest Land Managed Forest Land Managed Forest 20 1989 143 2 19 143 2 19 143 2 19 143 2 19 143 2 19 143 2 19 143 2 19 143 2 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15	Candomic Subs Candomic Subs Previous Land Uses Candomic Subs Candomic	Ē	Pla	antation														×
MFL-P-PL-P-40<-MFL-MF-	MFL-P-PL-P-40<-MFL-MF-				e							1		(2000)	Remark	Р	C N	л
MFL-P-PL-P-41 Unit 7.1 Managed Forest Land Managed Forest 20 1989 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Image: Substategory Land use substategory Corpland Settlements Other Land Corpland Corpla			a strate in the second s		Unit 7.2	Managed Forest L	.and	Plantation		NA		NA					×
Image: Subscription of the managed Forest (drained) Area update mode K Image: Current Land use subdivision Area update mode K Image: Current land use subdivision Current inventory year only Image: Current inventory year only Image: Current land use subcategory Image: Current inventory year and all subsequent inventory years Remark Image: Current land use category Image: Current inventory years Image: Current inventory years Image: Current land use category Image: Current inventory years Image: Current inventory years Image: Current land use category Image: Current inventory years Image: Current inventory years Image: Current land use category Image: Current inventory years Image: Current inventory years Image: Current land use category Image: Current inventory years Image: Current inventory years Image: Current land use category Image: Current inventory years Image: Current inventory years Image: Current land use category Image: Current land use category Image: Current land use category Image: Current land use category Image: Current land use category Image: Current land use category Image: Current land use category Image: Current land use category Image: Current land use category Im	Current Land use subdivision Area update mode Image: Current Land use subdivision Other Managed Forest (drained) Area update mode Image: Current inventory year only Land use subcategory Current inventory year and all subsequent inventory years Image: Current inventory year and all previous inventory years Unmanaged Forest Land Current inventory year and all previous inventory years Image: Cancel transmitted or		•						Managed Fo	rest	20		1989	0 (>		3	U	×
Current Land use subdivision Area update mode X X Other Managed Forest (drained) Current inventory year only Current inventory year only X Land use subcategory Current inventory year and all subsequent inventory years Remark Unmanaged Forest Land Update Cancel Land use category Update Cancel Grassland 500 Vetlands Vetlands 0 0	Current Land use subdivision Area update mode X X X X Other Managed Forest (drained) Current inventory year only Current inventory year and all subsequent inventory years Current inventory year and all previous inventory years Remark X Unmanaged Forest Land Update Cancel emark Cropland 2500 emark emark Cropland 2500 Settlements 0 Other Land 0 Other Land 0		•	MFL-P-PL-P-41<-M	IFL-MF	Unit 7.1	Managed Forest L	.and	Managed Fo	rest	20		1989	··> 000 ···>		Internet and I		×
Other Managed Forest (drained) Current inventory year only Current inventory year only Land use subcategory Current inventory year and all subsequent inventory years Remark Unmanaged Forest Land All inventory years emark Land use category Update Cancel Grassland 500 Wetlands 0 Settlements 0	Other Managed Forest (drained) Current inventory year only Current inventory year and all subsequent inventory years Land use subcategory Current inventory year and all previous inventory years Remark Unmanaged Forest Land All inventory years emark Cropland 2500 emark Grassland 0 Settlements Other Land 0 Other Land		*					~		~				<->				
Image: Construction of the subcategory Current inventory year and all subsequent inventory years Remark Image: Construction of the subcategory Current inventory year and all subsequent inventory years Remark Image: Construction of the subcategory Image: Construction of the subcategory Image: Construction of the subcategory Remark Image: Construction of the subcategory Image: Constructio	Land use subcategory Current inventory year and all subsequent inventory years Remark Unmanaged Forest Land Current inventory year and all previous inventory years Remark Land use category All inventory years emark Cropland 2500 emark Grassland 500 Vetlands Vetlands 0 0 Settlements 0 0					Current Land use	subdivision	Area u	pdate mode					× ĸ				
Land use subcategory Current inventory year and all subsequent inventory years Remark Unmanaged Forest Land Inventory year and all subsequent inventory years Image: Cancel of the sector	Land use subcategory Current inventory year and all subsequent inventory years Remark Unmanaged Forest Land Current inventory year and all previous inventory years emark Land use category Ulpdate Cancel emark Cropland 2500 emark emark Grassland 500 Vetlands 0 Vetlands 0 0 0	Œ	. Ot	ther Managed Forest (drained)													×
Land use subcategory Current inventory year and all previous inventory years Remark Unmanaged Forest Land All inventory years Image: Cancel of the mark Land use category Update Cancel of the mark Cropland 2500 Image: Cancel of the mark Grassland 500 Image: Cancel of the mark Wetlands 0 Image: Cancel of the mark Settlements 0 Image: Cancel of the mark	Land use subcategory © Current inventory year and all previous inventory years Remark Unmanaged Forest Land All inventory years Image: Cancel of the sector o	- E.	*						5	S (S)	has seen as the							
Unmanaged Forest Land O calcent frictions y feat is a promotion friction y feat is Land use category Update Cancel Cropland 2500 Grassland 500 Wetlands 0 Settlements 0	Unmanaged Forest Land All inventory years Land use category Update Cancel Cropland 2500 Grassland 500 Wetlands 0 Settlements 0 Other Land 0				I and use	e subcategory								Rema	rk			
Land use category Update Cancel Cropland 2500 Grassland 500 Wetlands 0 Settlements 0	Land use category Update Cancel emark Cropland 2500 Grassland 500 Wetlands 0 Settlements 0 Other Land 0				Eurio usi	c subcategory					evious inver	ntory years		- Conta				
Cropland 2500 Grassland 500 Wetlands 0	Cropland 2500 Grassland 500 Wetlands 0 Settlements 0 Other Land 0		Unma	naged Forest Land					inventory yea	5								
Cropland 2500 Grassland 500 Wetlands 0 Settlements 0	Cropland 2500 Grassland 500 Wetlands 0 Settlements 0 Other Land 0			La	nd use cate	aorv						Update	Cance	emark				
Grassland 500 Wetlands 0 Settlements 0	Grassland 500 Wetlands 0 Settlements 0 Other Land 0	C	bacland								2500							
Settlements 0	Settlements 0 Other Land 0										Constraints of the							
	Other Land 0	W	etlands								0							
Other Land 0		S	ettlemen	its														
		0	ther Lan	ıd							0							



INTERGOVERNMENTAL PANEL ON Climate change

IDCC

LRM – EXAMPLE – Approach 3 – 2009 Merging ULs

44244	Land representation table Annua	U.S.								
gions		Source Land Unit								
gion	Region 3	Land use subcategory	Managed For	rest Land			Арргоа	ach 3	200	
		Land use subdivision	Plantation							
	Land use	Land unit	Unit 7.1 (rem	aining part)				Remark		
F	orest Land	Area [ha]	1500							
	Land	d use						Remark		
	Managed Forest Land	-								
P	Managed Forest Land	Land use subcategory	Managed Fo	rest Land						
	Managed Forest	Land use subdivision	Plantation				1	Remark	×	
÷		Land unit					-		×	
±		Area [ha]	Unit 7.2	+1300	lua)				×	
									×	
	Land unit code				Merge	Cancel	Year of	Area		
	(Automatic)	(User defined)	subcateg	ory	subdivision	(years)	conversion	(2009) Re (ha)	eman PCM	
	HFL-P-PL-P-20	Unit 7.2	Managed Forest	Land Plan	tation	NA	NA	5000 ↔	x x	
	HFL-P-PL-P-40	Unit 7.1 (remaining part)	Managed Forest	Land Plan	tation	NO	NO	1500 💮	🗹 🔽	
	*			~	~	/		()	2	
		Current Land use s	ubdivision					Remark		
æ	Other Managed Forest (drained	i)				_			×	
	**					~	1			
	Land	d use subcategory			Area (2009) (ha)			Remark		
.	Unmanaged Forest Land					0				
	Land use	category			Area (2009) (ha)			Remark		
C	ropland					3500				
	rassland			1500						
	/etlands ettlements					0				

Year: 2009 | Base year for assessment of uncertainty in trend: 1990 | CU2 Equivalents: SAR GWPs (100 year time horizon) | Database file: (H:\Shared drives\/PCC-1SU\/inventory software\/ipcc200b.accdb)



LRM – EXAMPLE – Approach 3 – 2009 Final Status

ions	Land representation table	Annual Ian	d representation matrix (App	roach 2 & 3)							100.00	
jion	Region 3	~	Region area (ha)	16,000.000	Discrepa	ncy (ha) OK		Арргоа	ich 3		20	
			Current Land use	subdivision					Remark			
Đ)									2	
Đ											2	
Ð	Plantation										2	
	Land unit code (Automatic)		Land unit code (User defined)	Previous La subcateg		Previous Land use subdivision	Transition period [T] (years)	Year of conversion	Area (2009) (ha)	Remark	РСМ	
	MFL-P-PL-P-20		Unit 7.2	Managed Forest	t Land	Plantation	NA	NA	6500 ()		2 ×	
	*				~	~			(··)		2	
			Current Land use	subdivision					Remark			
Đ	Other Managed Forest (d	rained)									2	
	*						~					
		Land use	subcategory			Area (2009) (ha)			Remark			
<u>.</u>	Unmanaged Forest Land	d use cate	aory			Area (2009)	0		Remark			
						(ha)						
200	ropland rassland						3500 1500					
G	Tassianu						1500					
		Land use	subcategory			Area (2009) (ha)		Remark				
•	Managed Grassland						1500	1500				
6	Managed (pasture)	_	Current Land use	subdivision	_			Remark				
	(pastere)			1			1	1				
	Land unit code		Land unit code	Previous La		Previous Land use subdivision	Transition perior [T]	Year of conversion	Area (2009)	Remark	PCM	
	(Automatic)		(User defined)	subcateg	gory	Subdivision	(years)	conversion	(ha)			



Annual land representation matrix

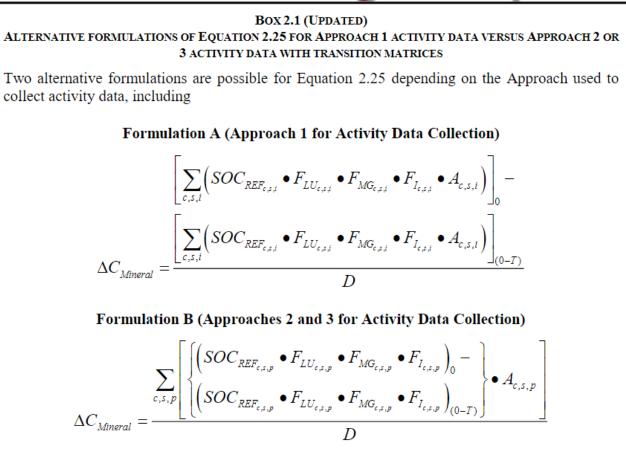
gion	Region 3		~	Region area	(ha)	17,1	00.000	Approach 3								200
		Initial	Fore	st Land	Cro	pland	Gra	ssland	Wet	lands	Settle	ments	Othe	r Land		
			Managed Forest Land	Unmanaged Forest Land	Cropland Annual Crops	Cropland Perennial Crops	Managed Grassiand	Unmanage d Grassland	Managed Wetlands	Unmanage d Wetlands	Settleme nts (Treed)	Settleme nts (Other)	Managed Other Land	Unmanage d Other Land	Final Area (ha)	Net chang (ha)
Fores	t Land	Managed Forest Land	14100												14100	0
		Unmanaged Forest Land													0	0
Cropi	and	Cropland Annual Crops			500										500	0
		Cropland Perennial Crops				2000									2000	0
Grass	land	Managed Grassland					500								500	0
		Unmanaged Grassland													0	0
Wetla	nds	Managed Wetlands													0	0
		Unmanaged Wetlands													0	0
Settle	ments	Settlements (Treed)							-						0	0
		Settlements (Other)													0	0
Other	Land	Managed Other Land													0	0
		Unmanaged Other Land													0	0
		Initial Area (ha)	14100	0	500	2000	500	0	0	0	0	0	0	0	17100	0

No data Input, just for verification (not exportable yet)





Mineral soil SOC change – Equation 2.25



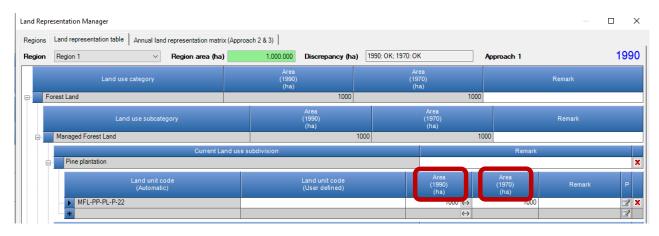
Where:

p = a parcel of land representing an individual unit of area over which the inventory calculations are performed.

The software applies the 2 formulations according to the approach for land
representation selected for the Region to which the unit of land belongs



SOC change – Formulation A - LRM



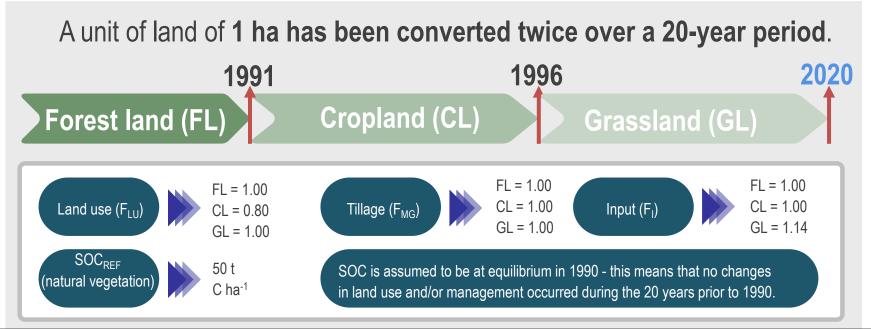
Approach 1 does not identify land-use conversions, thus:

- ✓ SOC changes are estimated by comparison of total SOC stock across the land representation (Region/Country) in the inventory year and 20 years before the inventory year
- ✓ The Land Representation Manager requires for each unit of land to input the area in the inventory year as well as the area of 20 years before





SOC change – Example



	1	-		-			
Year	1990	1995	2000	2005	2010	2015	2020
Land Use Category	FL	CL	GL	GL	GL	GL	GL
FL area (ha)	1	0	0	0	0	0	0
CL area (ha)	0	1	0	0	0	0	0
GL area (ha)	0	0	1	1	1	1	1

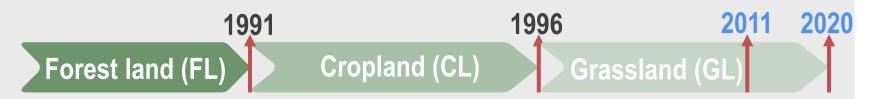


INTERGOVERNMENTAL PANEL ON Climate change

IDCC

SOC change – Example – Formulation A

A unit of land of 1 ha has been converted twice over a 20-year period.



		Form	nulation A				
Year	1990	1995	2000	2005	2010	2015	2020
Land Use Category	FL	CL	GL	GL	GL	GL	GL
FL area (ha)	1	0	0	0	0	0	0
CL area (ha)	0	1	0	0	0	0	0
GL area (ha)	0	0	1	1	1	1	1
SOC _{0_GHGI} (t C)	50.00	40.00	57.00	57.00	57.00	57.00	57.00
SOC _{(0-T)_GHGI} (t C)	50.00	50.00	50.00	50.00	50.00	40.00	57.00
∆C (t C yr⁻¹)	0.00	-0.50	+0.35	+0.35	+0.35	+0.85	0.00



INTERGOVERNMENTAL PANEL ON Climate change

SOC change – Formulation A – Example

Calculation is made at "Region" level, in **1995** in our case we have:

- a hypothetical SOC loss in FL,

Category: Forest Land Subcategory: 3.B.1.a - Forest Land	r, Forestry and Other Land Use Id orest land Remaining Forest land Iges in mineral soils - Approach 1 (Information ite	sm)				199
Region SOC test (Formul						
	Land use catego	Γ γ		Equation 2.25 - A		
Land unit code	Lar	id use during reporting year	Soil organic carbon stock in mineral soils in year 1995 (tonnes C / ha)	Soil organic carbon stock in mineral soils in year 1975 (tonnes C / ha)	Annual change in carbon stocks in mineral soils (tonnes C / yr)	
			SOC(1995)	SOC(1975)	∆Cmineral = ((SOC(1995) - SOC (1975)) / 20	
MFL-ST-NF-TG-26	Managed Forest Land	SOC test	0	50	-2.5	3 8 3
Total						
			0	50	-2.5	

- a hypothetical SOC gain in CL,

Worksheet Sector: Category: Subcategory: Sheet: Data	Agriculture, Forestry an Cropland 3.B.2.a - Cropland Ren SOC Changes in mine		m)				1995
Region S(OC test (Formulation A)	 Approach 1 					
		Land use catego			Equation 2.25 - A		
La	nd unit code	Lar	d use during reporting year	Soil organic carbon stock in mineral soils in year 1995 (tonnes C / ha)	Soil organic carbon stock in mineral soils in year 1975 (tonnes C / ha)	Annual change in carbon stocks in mineral soils (tonnes C / yr)	
				SOC(1995)	SOC(1975)	∆Cmineral = ((SOC(1995) - SOC (1975)) / 20	
ACL-ST-2	8	Cropland Annual Crops	SOC test	40	0	2	3 8 9
				40	0	2	

that correspond to a total real net SOC loss of 0.5 t C ha yr⁻¹



SOC change – Formulation A – Example

Calculation is made at "Region" level, in **2015** in our case we have: - an **artefact SOC loss** in **CL**,

Category: Cropland Subcategory: 3.B.2.a - 1 Sheet: SOC Cha Data	Cropland Remaining Cropland nges in mineral soils - Approach 1 (Information item)					2015
Region SOC test (Form	ulation A) - Approach 1 Land use category			Equation 2.25 - A		
	Land use category			Equation 2.25 - A		
Land unit code	e Land t	se during reporting year	Soil organic carbon stock in mineral soils in year 2015 (tonnes C / ha)	Soil organic carbon stock in mineral soils in year 1995 (tonnes C / ha)	Annual change in carbon stocks in mineral soils (tonnes C / yr)	
			SOC(2015)	SOC(1995)	∆Cmineral = ((SOC(2015) - SOC (1995)) / 20	
ACL-ST-28	Cropland Annual Crops	SOC test	0	40	-2	2 2 7
Total						
			0	40	-2	

- an artefact SOC gain in GL,

Category: Grass Subcategory: 3.8.3. Sheet: SOC (Data	ulture, Forestry and Other Land Use land a - Grassland Remaining Grassland Changes in mineral soils - Approach 1 (Inf omulation A) v - Approach 1			201
	Land u	se category	Equation 2.25 - A	
Land unit c	ode	Land use during reporting yea	Soil organic carbon stock in mineral soils in year 2015 (tonnes C / ha) (tonnes C / ha) Annual change in c mineral soils in year 1995 (tonnes C / ha)	soils
			SOC(2015) SOC(1995) ΔCmineral = ((SO((1995))	
MGL-ST-SA-30	Managed Grassland	SOC test	57 0	2.85 📝 🖬 💐
Total				2.20
			57 0	2.85

INTERGOVERNMENTAL PANEL ON CLIMATE CHANES

- thus, a total net SOC gain of 0.85 t C ha yr⁻¹



SOC change – Example – Formulation B

A unit of land of 1 ha has been converted twice over a 20-year period.

1991199620112020Forest land (FL)Cropland (CL)Grassland (GL)

	Formulation B														
Year	1990	1995	2000	2005	2010	2015	2020								
Land Use Category	FL	CL	GL	GL	GL	GL	GL								
FL area (ha)	1	0	0	0	0	0	0								
CL area (ha)	0	1	0	0	0	0	0								
GL area (ha)	0	0	1	1	1	1	1								
SOC _{0_GHGI} (t C)	50.000	47.500	49.875	52.250	54.625	57.000	57.000								
SOC _{(0-T)_GHGI} (t C)	50.000	50.000	47.500	49.875	52.250	54.625	57.000								
∆C (t C ha⁻¹ yr⁻¹)	0.000	-0.500	+0.475	+0.475	+0.475	+0.475	0.000								



SOC change – Formulation B – Example

Calculation is made at "Region" level, on the basis of the actual SOC stock in the SOM for each inventory year (land tracking). The unit of land "**SOC test**" has:

- In 1995, a net SOC loss of 0.5 tC ha yr⁻¹
- In 2000, a net SOC gain of 0.475 tC ha yr⁻¹

Worksheet Sector: Category: Subcategory: Sheet: Data	Agriculture, Forestry a Cropland 3.B.2.b.i - Forest Land Annual net C stock c	nd converted to C	Cropland	iineral soils - Appro	pach 2 and Approa	ach 3 (Default met)	hod)								199	95			
Region SO	OC TEST (formulation B)																		
	Land	d use category					Lime		Equation 2.25 -	- 8	4								
					Area (ha)	Reference carbon stock for the climate and soil combination (tonnes C / ha)	dependence of stock change factors (D) or number of years over a	the subdivision in the current inventory year	management r regime for the subdivision in	the current	carbon st e mineral se in equilibriu t the curr ar subdivis	stock in carbon soils at minera ium for for urrent subdivi	ral soils or the vision at version	Annual change i carbon stocks ir mineral soils (tonnes C / yr)					
Land unit co	ode: Initial I	land use		luring reporting year	National statistics or international data sources		2 Default value is 20	National statistics or international data sources	National statistics or international data sources	National statistics or international data sources	al (0) * Fmg	ef*Flu ng(0)*		ΔCmineral = ((SOC(0) - SOC (c))*A)/D					2000
					A	SOCref	D	Flu(0)	Fmg(0)	Fi(0)	SOC(DC(c)	∆Cmineral					
SOC Test	Managed F	SOC Test	Cropland An	. SOC Test	1	1 50	0 20	0.8	B 1		1	40	50	-0	0.5 📝 🔒	2			
Total					7										0.5				
				Lan	d use category								Equatio	on 2.25 - B					
								Area (ha)	Reference carbon stu- for the clin and so combinat (tonnes C.	nce of sta tock char imate numb oil years of sing	tock St ange fac s (D) or us ber of the over a in ngle inv ory time od (T)	Stock change actor for land- use system for ne subdivision in the current nventory year (-)	Stock ch factor manage regime fo subdivisi	hange r for facto for the sion in rrent ry year	k change tor for C ut for the livision in e current ntory year (-)	carbon stock in mineral soils at equilibrium for the current subdivision		carbon stocks in mineral soils (tonnes C / yr)	
	155. 3	Land	d unit code	Initial I	land use		uring reporting year	internation data source	or Tables 2.3 nal WS ces	is 2	lt value s 20 in d	National statistics or international data sources	Natior statistic internati data sou	ics or statis ational interr purces data :	ational listics or rnational a sources	SOC(0) = SOCref * Flu (0) * Fmg(0) * Fi(0)		ΔCmineral = ((SOC(0) - SOC (c)) *A) / D	
								A	SOCre		D	Flu(0)	Fmg(Fi(0)	SOC(0)	SOC(c)	∆Cmineral	
		► SOC	2 Test	Cropland A	SOC test	Managed Gr	SOC test		1	50	20	1		1.14	1	57	47.5	0.475	333
WMO	UNEP	Total							1									0.475	

SOC change – Example

Across the entire timeseries both formulations count for the same quantity of **net SOC gain** of **7 tC ha** from a tropical dry forest to an improved grassland

	Comparison														
Year	1990	1995	2000	2005	2010	2015	2020	TOTAL							
(5-year periods)		t C yr ⁻¹													
Formulation A	0.000	-0.500	+0.350	+0.350	+0.350	+0.850	0.000	+7.000							
Formulation B	0.000	-0.500	+0.475	+0.475	+0.475	+0.475	0.000	+7.000							





Stock-Difference Method

- Can be selected in the Land Representation Manager for each C pool (biomass/DOM/SOM) of each unit of land
- Each land use category has dedicated C-pool-specific worksheets for the Stock-Difference method, units of land for which the Stock-Difference method has been selected for a C pool are automatically displayed in the Stock-difference-Worksheet of that C pool





SD Method – Example – 2000

Same units of land as per Land Representation example

Worksheet Sector: Agricult Category: Forest I Subcategory: 3.B.1.a	lture, Forestry and Other Land Use		(GAL4, Bior	mass change (SD) tomass cha	inge (Abrupt) DON	1 (GAL 1/1) DOM (SD	1/1) SOM Mineral (Approach 1 - Informati	on item) SOM Mineral	(Approach 2.3) SOM Mineral (SD) SC	OM Organic Drained S	DM Organic Rewetted				
Region Region 3	 Approach 	h 3														
1	Land use category Equation 2.8															
			Area (ha)	factor for standing stock (t d.m. / m3	Biomass expansion factor for conversion of merchantable volume to above-ground biomass (t d.m. / m3 fr	Basic wood density (t d.m. / m3 fresh volume)	Merchantable growing stock volume at the beginning of the inventory period (t1) (m3 / ha)	Total initial above-ground biomass (t d.m. / ha)	Merchantable growing stock volume at the end of the inventory period (t2) (m3 / ha)	Total final above-ground biomass (t d.m. / ha)	Ratio of below- ground biomass to above-ground biomass (R) (t bg d.m. /t ag d.m.)	Biomass carbon fraction (tonnes C / tonne d.m.)	Total initial biomas: C stock (tonne C / ha)	Total final biomass C stock (tonne C / ha)		Annual change in carbon stocks in biomass (tonnes C / yr)
Land unit code		Land use during reporting year	National statistics or international data sources	BCEFs=BEF2 *D or specified	Table 3.A.1.10 / National statistics or international data sources	Tables 4.13 / 4.14 / 4.6 WS / National statistics or international data sources	National statistics or international data sources	AB(t1)=V(t1)*BCEFs or specified	National statistics or international data sources	AB(t2)=V(t2)*BCEFs or specified	Zero (0) or Table 4.4 / 4.5 WS / National statistics or international data sources	0.47 / Table 4.3 / 0.451 WS mangroves	CB(t1) = AB(t1) * (1+R) * CF	CB(t2) = AB(t2) * (1+R) * CF	T = t2 - t1	ΔCB = (CB(t2) - CB(t1)) / T * A
		(A	BCEFs	BEF2	D	V(t1)	AB(V(t2)	AB(t	R	CF	CB(t1)	CB(t2)	Т	АСВ
	anaged For Managed Forest		3000	1				Specified 0		Specified	44 0.29			28.9476	11	7894.8
Unit 7.2	Plantation	Plantation	5000	1				Specified 60		Specified	64 0.29	0.51	39.47	42.1056	1	13158
													39.47	4 71.0532		21052.8





SD Method – Example – 2008

Worksheet Sector: Agric Category: Fore Subcategory: 3.B.	1/4) Biomass loss (GAL 2/4) Bio duture, Forestry and Other Land Use it Land La - Forest land Remaining Forest lanc all net C stock change in biomass - St - Approact	l ock difference method	ss (GAL 4/4) Biom	ass change (SE)) iomass cha	inge (Abrupt) DON	M (GAL 1/1) DOM (SD 1/1)	SOM Mineral (Approact	h 1 - Information ite	em) SOM Mineral (Appr.	nach 2,3) SOM	Mineral (SD) SOI	M Organic Drained	SOM Organic Rewette	d			
	Land use category									Equation 2	2.8							
				Biomass conversion and expansion factor for tanding stock (t d.m./m3 volume)	Biomass expansion factor for conversion of merchantable volume to above-ground biomass (t d.m. / m3 fr	Basic wood density (t d.m. / m3 fresh volume)	Merchantable growing stock volume at the beginning of the inventory period (t1) (m3 / ha)	Total initial above-gro (t d.m. / ha	ound biomass	Merchantable growing stock volume at the end of the inventory period (2) (m3 / ha)	Total final abov	ve-ground biomass I.m. / ha)	Ratio of below- ground biomass to above-ground biomass (R) (t bg d.m. / t ag d.m.)	Biomass carbon fraction (tonnes C / tonne d.m.)	Total inifial biomas: C stock (tonne C / ha)	s Total final biomass C stock (tonne C / ha)		Annual change in carbon stocks in biomass (tonnes C / yr)
Land unit code		Land use during reporting yea		BCEFs=BEF2 *D or specified	Table 3.A.1.10 / National statistics or international data sources	Tables 4.13 / 4.14 / 4.6 WS / National statistics or international data sources	National statistics or international data sources	AB(t1)=V(t1)*B(or specifie		National statistics or international data sources		V(t2)*BCEFs specified	Zero (0) or Table 4.4/4.5 WS / National statistics or international data sources	0.47 / Table 4.3 / 0.451 WS mangroves	CB(t1) = AB(t1) * (1+R) * CF	CB(t2) = AB(t2) * (1+R) * CF	T = t2 - t1	ΔCB = (CB(t2) - CB(t1)) / T *A
				BCEFs				AB(t1)		V(t2)		5(t2)	R			CB(t2)		АСВ
Unit 7.1 (remai Unit 7.2	Ianaged For Managed Forest Plantation	Managed Fore Plantation Plantation	1500 5000	1				Specified Specified	44 92		Specified Specified	76 96	0.29	0.51			1	3947.4 13158
															89.474	4 113.158	3	17105.4

1,500 ha clearcut and converted to grassland (no woody biomass) Abrupt change within the Gain and Loss Method

Biomass change - Pe Worksheet	Perennial (GAL) Biomass change - Annual (GAL)	Biomass change (SI Biom	nass change (Abrupt) ON	(GAL 1/1) DOM (SD 1/1) SOM	M Mineral (Approach 2,3)	SOM Mineral (SD) SOM C	Irganic Drained SOM Organi	c Rewetted					
Sector: A	Agriculture, Forestry and Other Land Use												
Subcategory: 3	Grassland 3.B.3.b.i - Forest Land converted to Grassland												
Sheet: In Data	Initial change in biomass carbon stocks on land converte	ed to another land category (abr	orupt change)										
Region Region	n 3 · · Approach 3												
		Land use category							Equation 2.16				
					Area (ha)		Above-ground biomass before the conversion (t U / ha)	Above-ground biomass after the conversion (t U / ha)	Ratio of below-ground biomass to above-ground biomass (R) (t bg U / t ag U)	Biomass carbon fraction (tonnes C / tonne d.m.)	Biomass C stocks before the conversion (tonne C / ha)	Biomass C stocks after the conversion (tonne C / ha)	Annual change in carbon stocks in biomass (tonnes C / yr)
Land unit c	code Initial land use	•	Land use duri	ing reporting year	National statistics or international data sources	d.m. or C	National statistics or international data sources	National statistics or international data sources	Zero (0) or Table 4.4 / 4.5 WS / National statistics or international data sources	0.47 / Table 4.3 / 0.451 WS mangroves	CB(b) = AB(b) * (1+R) * CF	CB(a) = AB(a) * (1+R) * CF	ΔCB = (CB(a) - CB(b)) * ΔA
					ΔA	U	AB(b)	AB(a)	R	CF	CB(b)	CB(a)	ΔСВ
Unit 7.1	lanaged Forest Land Plantation	Man	naged Grassland Ma	inaged (pasture)	1500	d.m.		72	0.29	0.51	0	47.3688	71053.2
											0	47.3688	71053.2
***	1000										EL ON Cli	iD	CC

SD Method – Example – 2009

5,000 ha clearcut at the beginning of the year

	mass increase (GAL 1/4) Biomass loss (GAL 2/4) Biomass loss (GAL 2/4																
Category: Forest Subcategory: 3.8.1. Sheet: Annua Data	Apriculture, Forestly and Other Land Use popy: Forest Land category: 3.B.1 a. Forest land category: 3.B.1 a. Forest land ct: Annual net C stock change is biomass - Stock difference method																
Region Region 3																	
	Land use category									Equ	uation 2.8						
			Area (ha)	Biomass conversion and expansion factor for standing stock (t d.m. / m3 volume)	above-ground biomass (t d.m. / m3 fr	Basic wood density (t d.m. / m3 fresh volume)	Merchantable growing stock volume at the beginning of the inventory period (t1) (m3 / ha)	Total initial above-groun (t d.m. / ha)	d biomass	Merchantable growing stock volume at the end of the inventory period (t2) (m3 / ha)	Total final above-ground bioma: (t d.m. / ha)	Ratic of below- ground biomass to above-ground biomass (R) (t bg d.m. /t ag d.m.)	Biomass carbon fraction (tonnes C / tonne d.m.)	Total initial biomass C stock (tonne C / ha)	Total final biomass C stock (tonne C / ha)		Annual change in carbon stocks in biomass (tonnes C / yr)
Land unit code			National statistics or international data sources	BCEFs=BEF2 *D or specified	Table 3.A.1.10 / National statistics or international data sources	Tables 4.13 / 4.14 / 4.6 WS / National statistics or international data sources	National statistics or international data sources	AB(t1)=V(t1)*BCE or specified		National statistics or international data sources	AB(t2)=V(t2)*BCEFs or specified	Zero (0) or Table 4.4 / 4.5 WS / National statistics or international data sources	0.47 / Table 4.3 / 0.451 WS mangroves	CB(t1) = AB(t1) * (1+R) * CF	CB(t2) = AB(t2) * (1+R) * CF		ΔCB = (CB(t2) - CB(t1)) / T *A
				BCEFs	BEF2		V(t1)	AB(t1)		V(t2)	AB(R		CB(t1)	CB(t2)		ΔCB
Unit 7.2	anaged For Plantation	Managed Fore Plantation	6500	1				Specified	91.4		Specified	18.5 0.29	0.51	60.13206	12.1711	1	-311745.915
· · · · · · · · · · · · · · · · · · ·														60.13206	12.17115		-311745.915





Wetlands Supplement

• All elements sourced from the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands are clearly identifiable because of the liliac color has been used.

In particular, following **methods** have been added:

✓ CO₂ emissions from Dissolved Organic Carbon (DOC) in drained Organic soils, in each land use category (3.B)

INTERGOVERNMENTAL PANEL ON CLIMATE CHANES

- \checkmark CO₂ removals in rewetted organic soils, in each land use category (3.B)
- ✓ SOM loss from excavation of coastal wetlands (3.B.4/5)
- ✓ SOM burning in peatlands (3.C.1)
- ✓ N_2 O emissions from rewetted organic soils (3.C.4)



Wetlands Supplement

• All elements sourced from the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands are clearly identifiable because of the liliac color has been used.

In particular, following categories have been added:

- ✓ 3.C.8 CH_4 emissions from Drained Inland organic soils
- \checkmark 3.C.9 CH₄ emissions from Drainage Ditches in Drained Inland organic soils
- ✓ 3.C.10 CH_4 emissions from Rewetting of Inland organic soils
- ✓ 3.C.11 CH_4 emissions from Rewetting of Mangroves and Tidal Marshes
- ✓ 3.C.12 N_2 O emissions from Aquaculture
- \checkmark 3.C.13 CH₄ emissions from Rewetted and Created Wetlands on Inland Wetland mineral soils

INTERGOVERNMENTAL PANEL ON CLIMATE CHANES





Thank you

https://www.ipcc-nggip.iges.or.jp/index.html

