Field Burning of Agricultural Residues

(Capacity Building Program for Indian Experts on National Greenhouse Gas Inventory Preparation as per Enhanced Transparency Framework Guidelines, 25 April 2024 – 1 May 2024, Indian Institute of Technology Gandhinagar, Gujarat, India)

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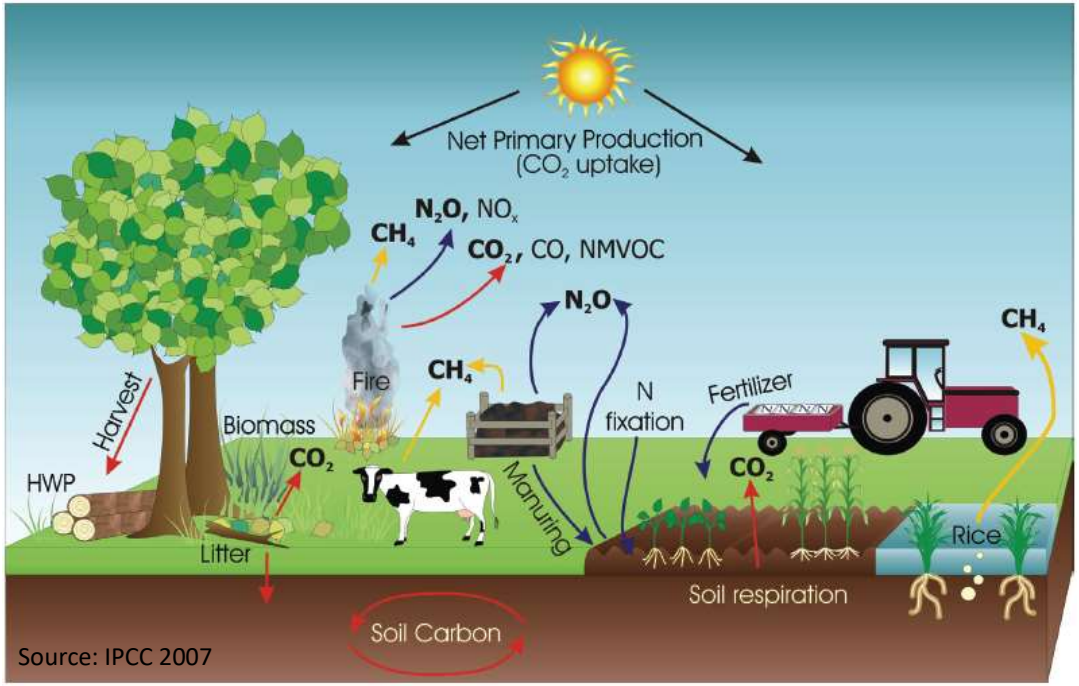
AFOLU Categories in the 2006 IPCC Guidelines

Biomass C Stock Changes (3B)

GHG Emissions from Biomass Burning [wild fires, crop residues (3C1)]



CO2 Emission from Liming (3C2)

CO2 Emission from Urea Application (3C3)

Soil N_2O Emissions (3C4, 3C5, and 3C6)

CH4 Emission from Rice Cultivation (3C7)

Soil C Stock Changes (3B)

CH4 Emission from Enteric Fermentation (3A1)

CH_4 and N_2O Emission from Manure Management (3A2)

EQUATION 2.27
ESTIMATION OF GREENHOUSE GAS EMISSIONS FROM FIRE

$$L_{fire} = A \bullet M_B \bullet C_f \bullet G_{ef} \bullet 10^{-3}$$

Where:

L_{fire} = amount of greenhouse gas emissions from fire, tonnes of each GHG e.g., CH_4, N_2O, etc.

A = area burnt, ha

M_B = mass of fuel available for combustion, tonnes ha^{-1}. This includes biomass, ground litter and dead wood. When Tier 1 methods are used then litter and dead wood pools are assumed zero, except where there is a land-use change (see Section 2.3.2.2).

C_f = combustion factor, dimensionless (default values in Table 2.6)

G_{ef} = emission factor, g kg^{-1} dry matter burnt (default values in Table 2.5)

Note: Where data for M_B and C_f are not available, a default value for the amount of fuel actually burnt (the product of M_B and C_f) can be used (Table 2.4) under Tier 1 methodology.

TABLE 2.5
EMISSION FACTORS (g kg^{-1} DRY MATTER BURNT) FOR VARIOUS TYPES OF BURNING. VALUES ARE MEANS ± SD AND ARE BASED ON THE COMPREHENSIVE REVIEW BY ANDREAE AND MERLET (2001)

(To be used as quantity 'G_{ef}' in Equation 2.27)

Category	CO_2	CO	CH_4	N_2O	NO_X
Savanna and grassland	1613 ± 95	65 ± 20	2.3 ± 0.9	0.21 ± 0.10	3.9 ± 2.4
Agricultural residues	1515 ± 177	92 ± 84	2.7	0.07	2.5 ± 1.0
Tropical forest	1580 ± 90	104 ± 20	6.8 ± 2.0	0.20	1.6 ± 0.7
Extra tropical forest	1569 ± 131	107 ± 37	4.7 ± 1.9	0.26 ±0.07	3.0 ± 1.4
Biofuel burning	1550 ± 95	78 ± 31	6.1 ± 2.2	0.06	1.1 ± 0.6

Note: The "extra tropical forest' category includes all other forest types.

Note: For combustion of non-woody biomass in Grassland and Cropland, CO_2 emissions do not need to be estimated and reported, because it is assumed that annual CO_2 removals (through growth) and emissions (whether by decay or fire) by biomass are in balance (see earlier discussion on synchrony in Section 2.4.

Hands-on exercise …

Using available country-specific data on crop residues (e.g. rice straw), let us use the ALU Software to:

1. Determine the harvested area, the fresh yield, and how crop residues are managed (e.g. burned, grazed or collected, and retained to the field)
2. Assign emission factor, including documentation
3. Calculate GHG emissions from burning of agricultural residues, and
4. Report activity data, other related information, and estimates in CRT for BTR.