Calculation of Emissions from Biomass Open Burning

Savitri Garivait, *JGSEE*

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The Joint Graduate School of Energy and Environment

Biomass Burning Emission - Methodology

$$Q(x) = M \times EF(x)$$

Emission Quantity of Species X (g)

Biomass Burned (kg)

f (area burned, burning efficiency, biomass density, etc…)

Emission Factor of Species X (g/kgdm)

f (vegetation type, burning conditions, species, etc…)

Biomass Burned (M)

$$M = A \times B \times \alpha \times \beta$$

Seiler and Crutzen (1980)

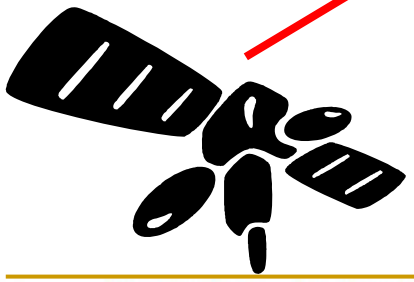
Biomass Burned (kg)

Area Burned (m^2)

Biomass Density (kg/m^2)

Fraction of Above Ground Biomass

Burning Efficiency

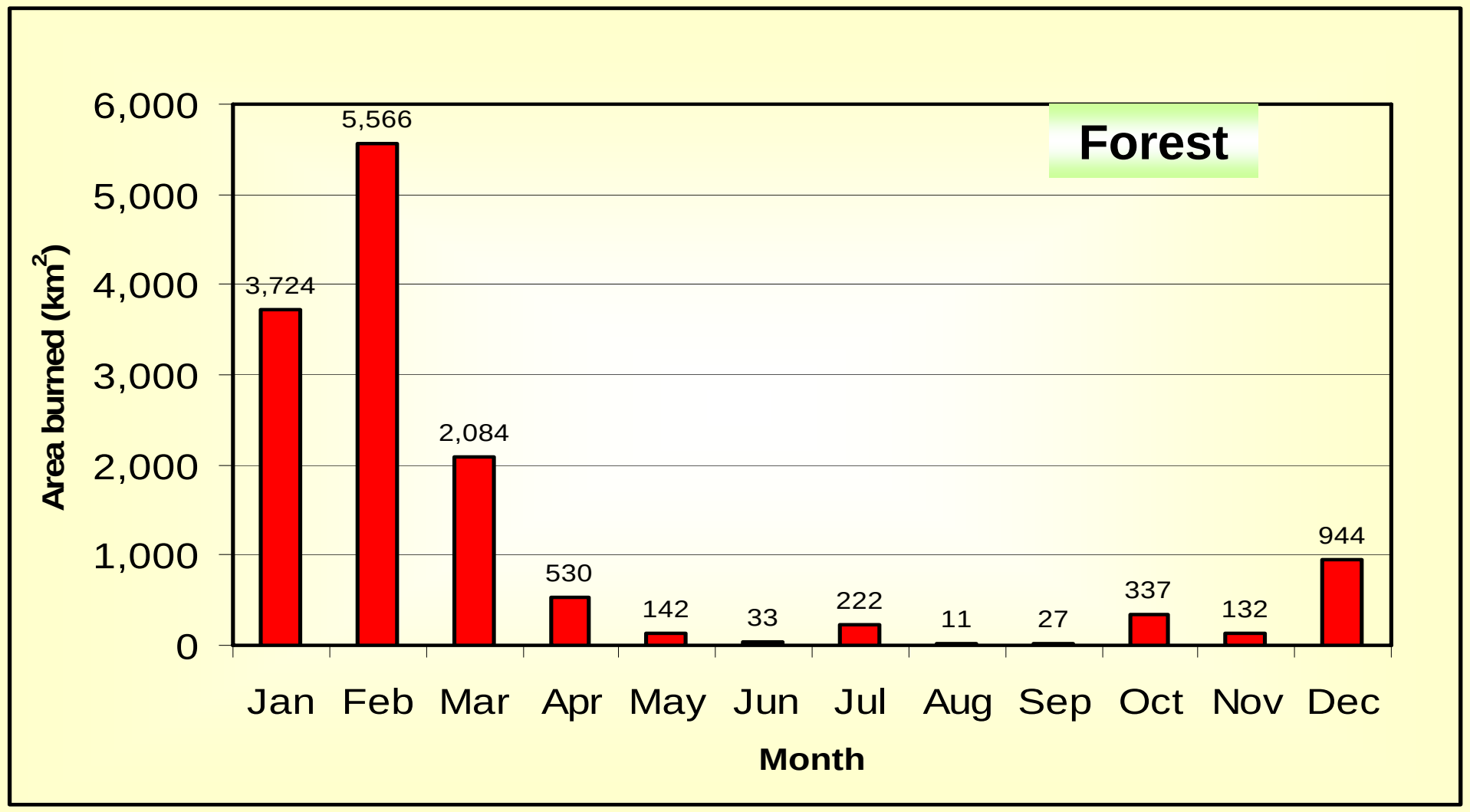


Exercise I: Calculation of Emissions from Biomass Burning in MRBSR in 2002

- **Materials – Excel Spreadsheet**
  - **Area burned from satellite data (Hotspots detected by DMSP-ANDES satellite)**
  - **Above ground biomass density of different type of vegetation**
  - **EF (CO_2, CO, CH_4, NO_x, N_2O, TPM)**
- **Output**
  - **Emission estimation for each of the 4 countries**

Exercise I: Calculation of Emissions from Biomass Burning in MRBSR in 2002

- **Area burned – Cambodia**



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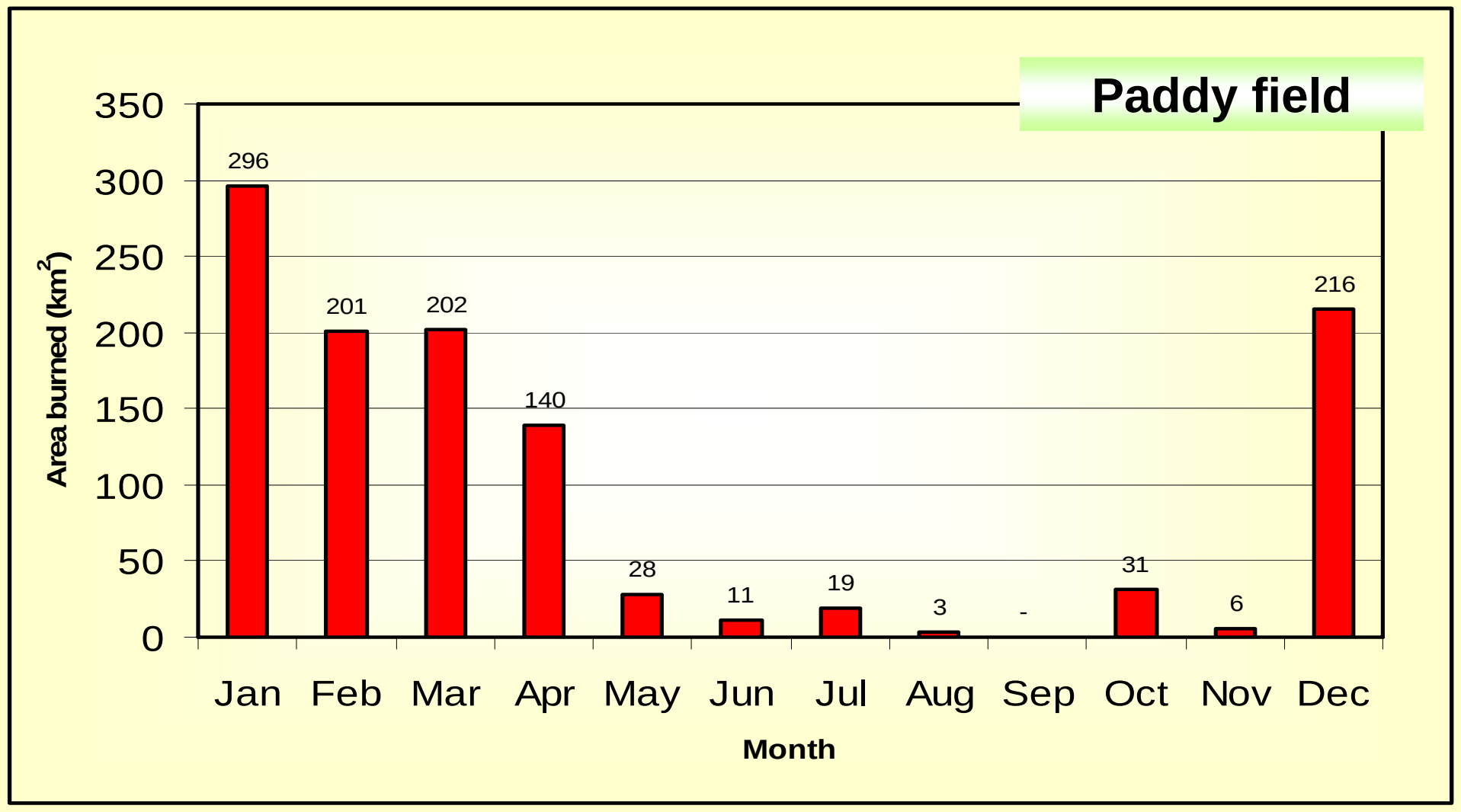

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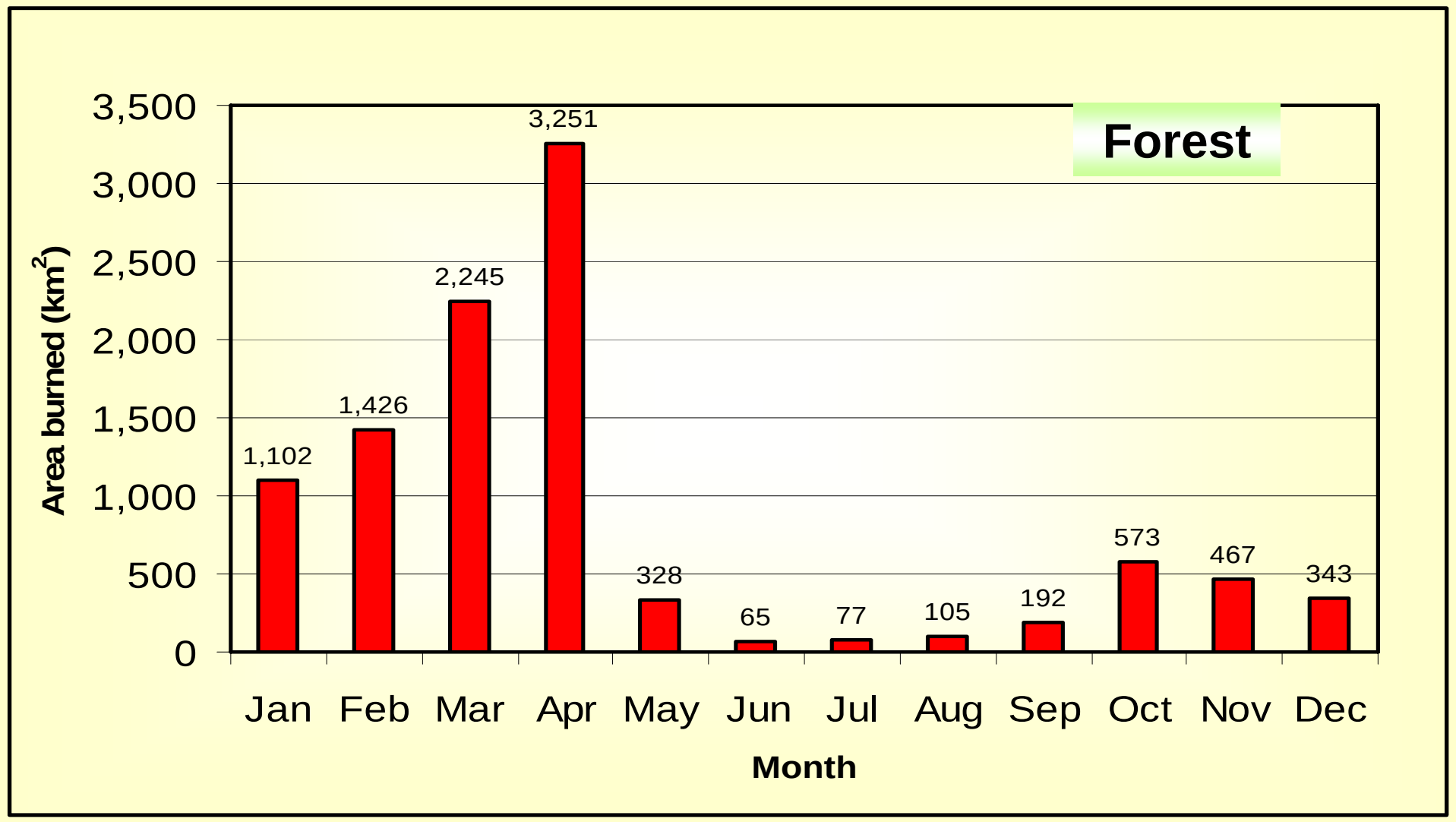
- **Area burned – Lao PDR**



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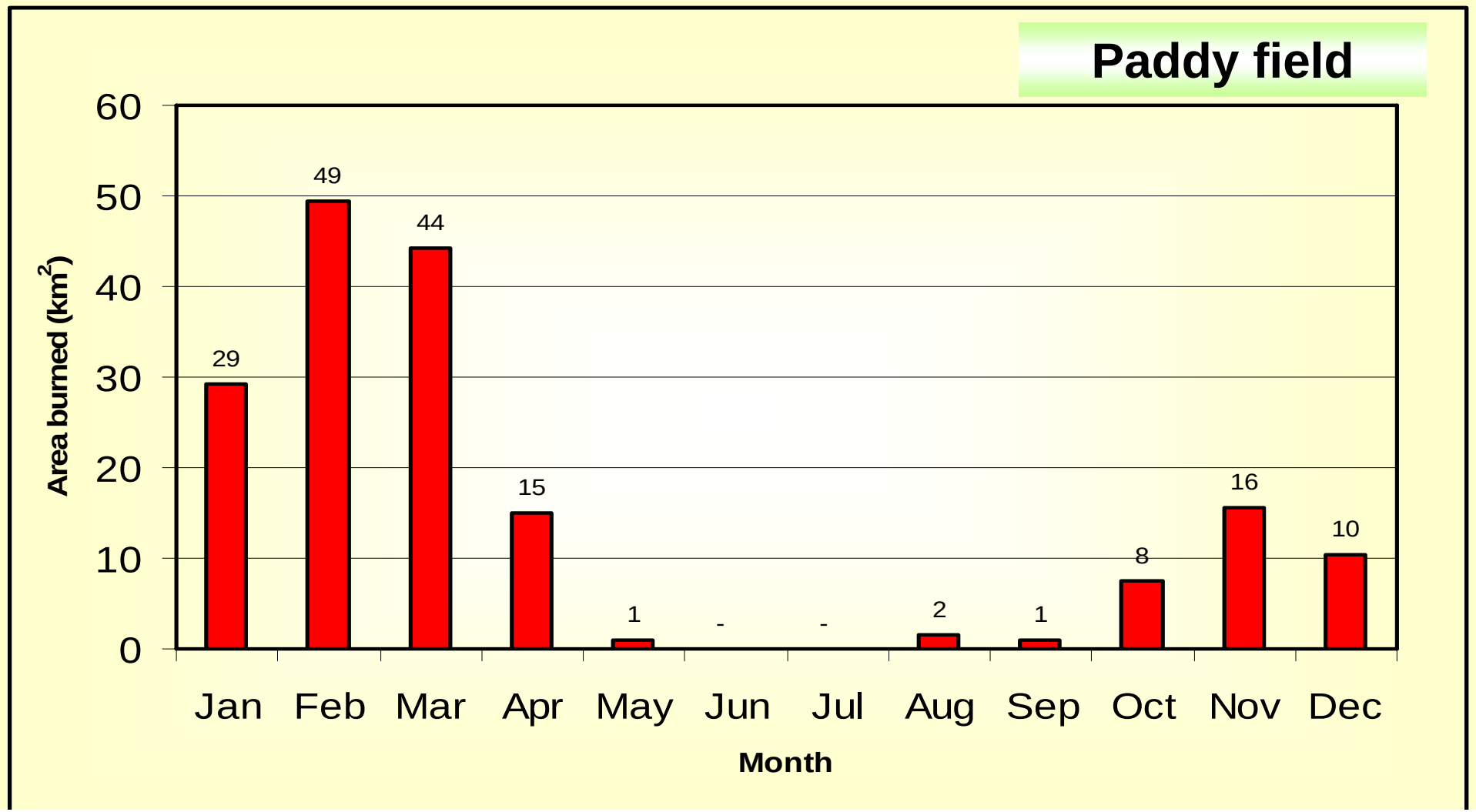

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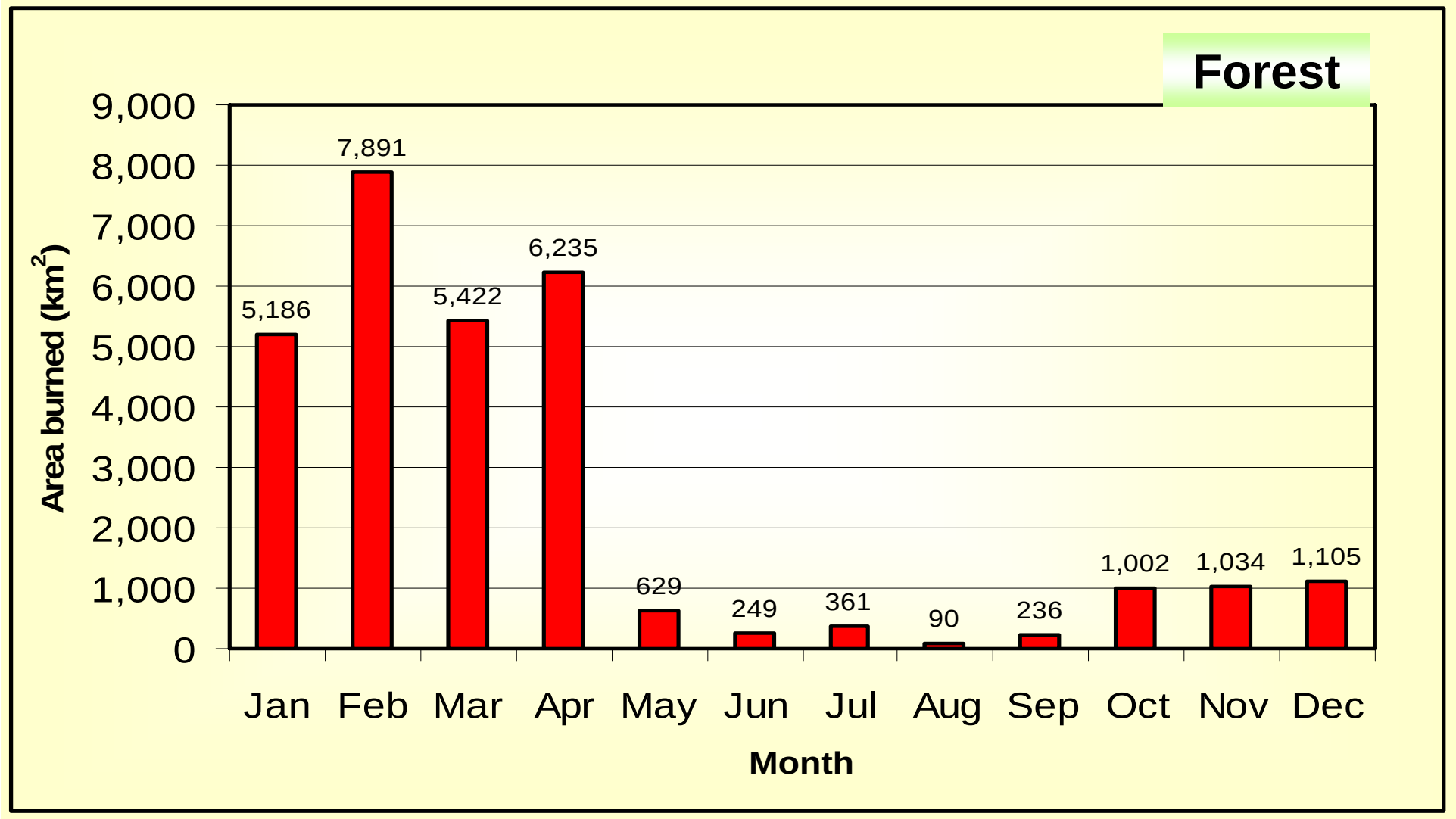
- **Area burned – Thailand**



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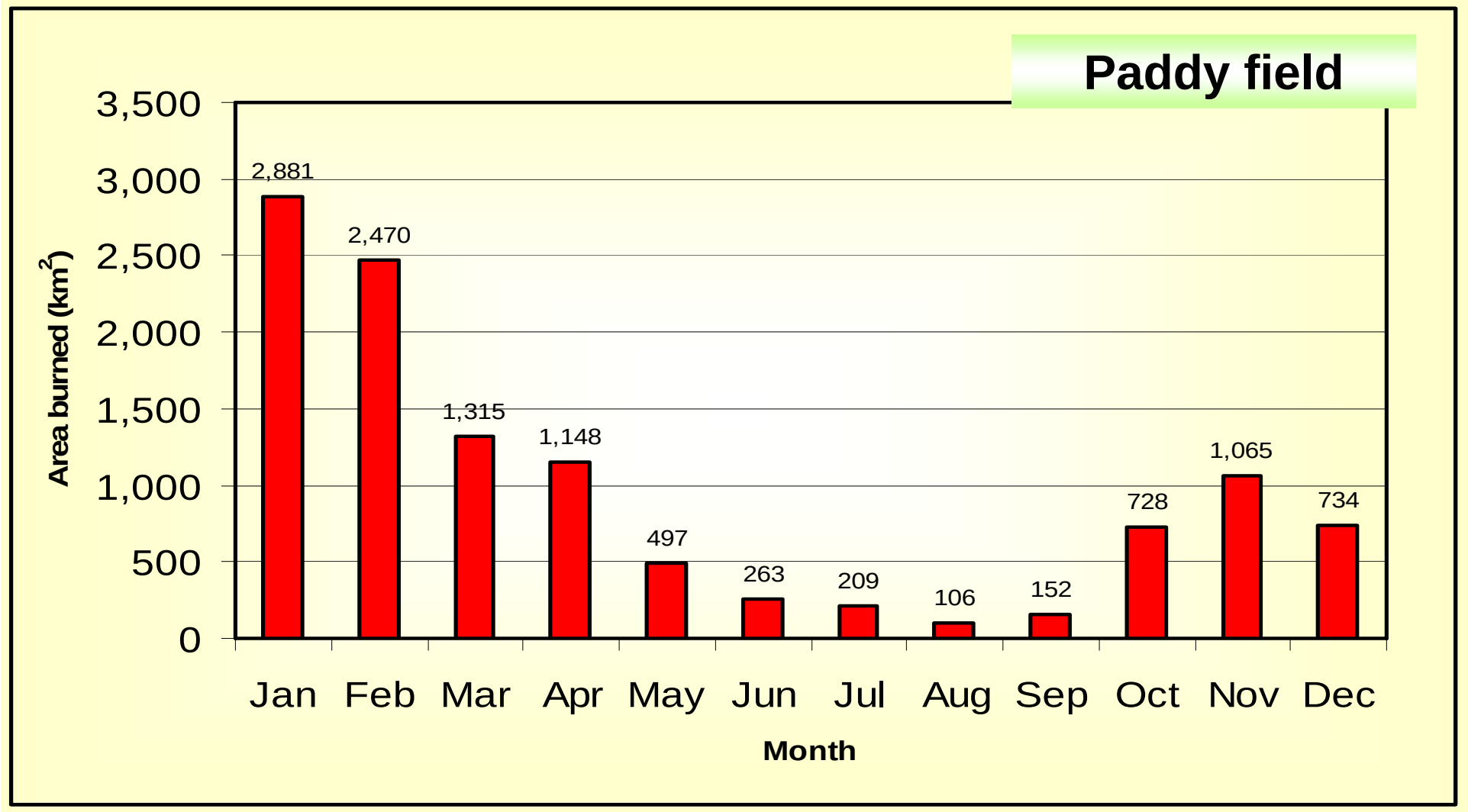
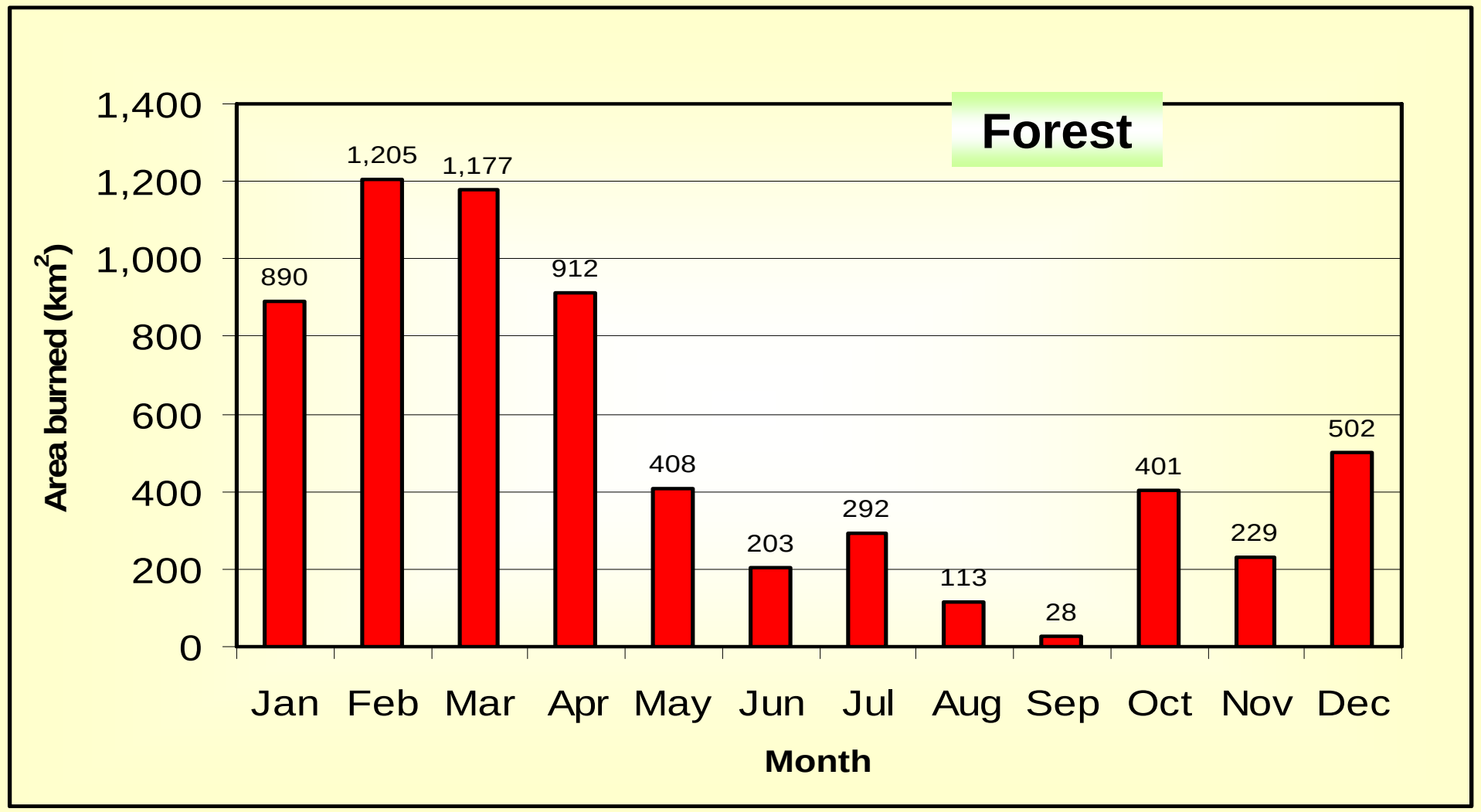


Exercise I: Calculation of Emissions from Biomass Burning in MRBSR in 2002

- **Area burned – Vietnam**



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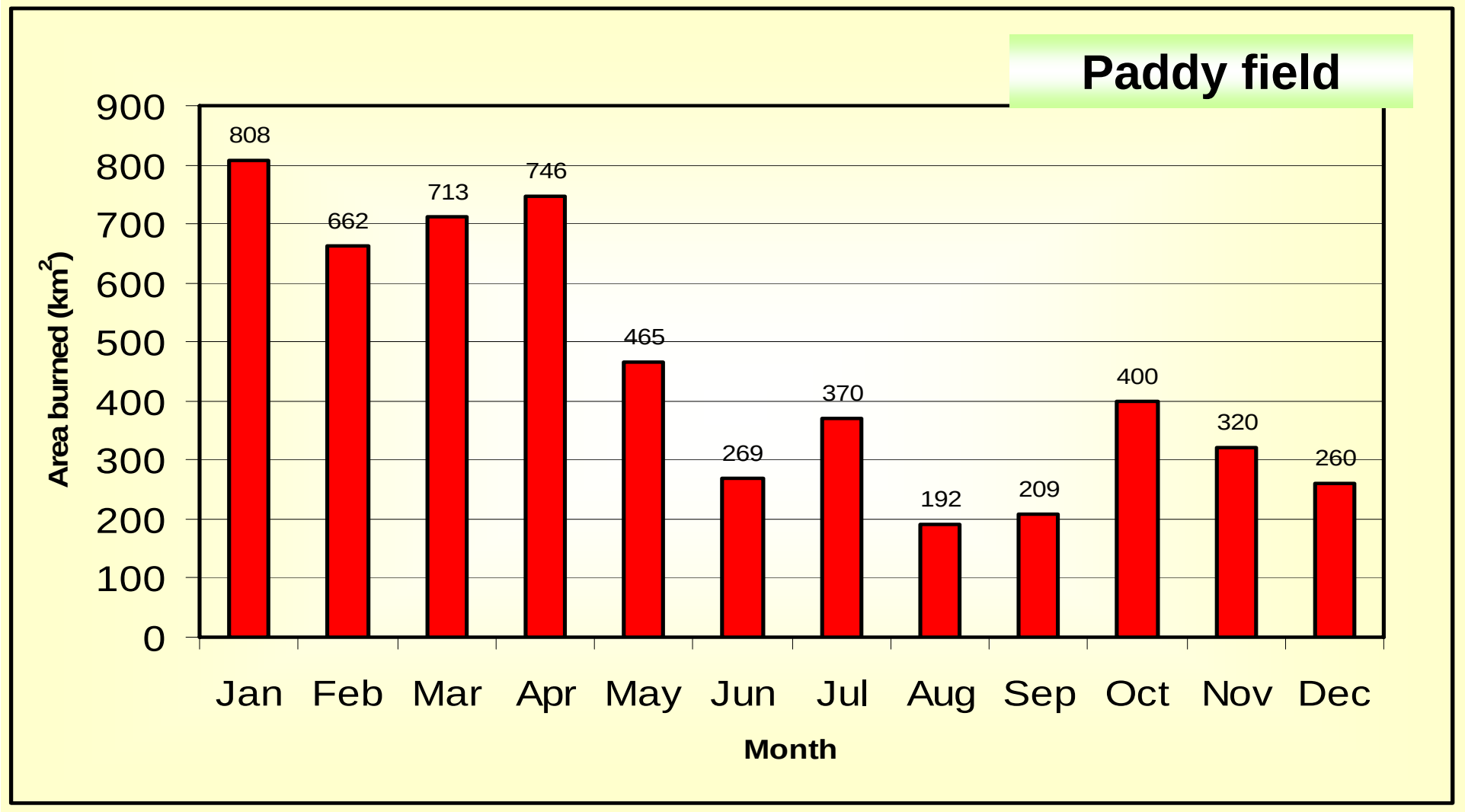

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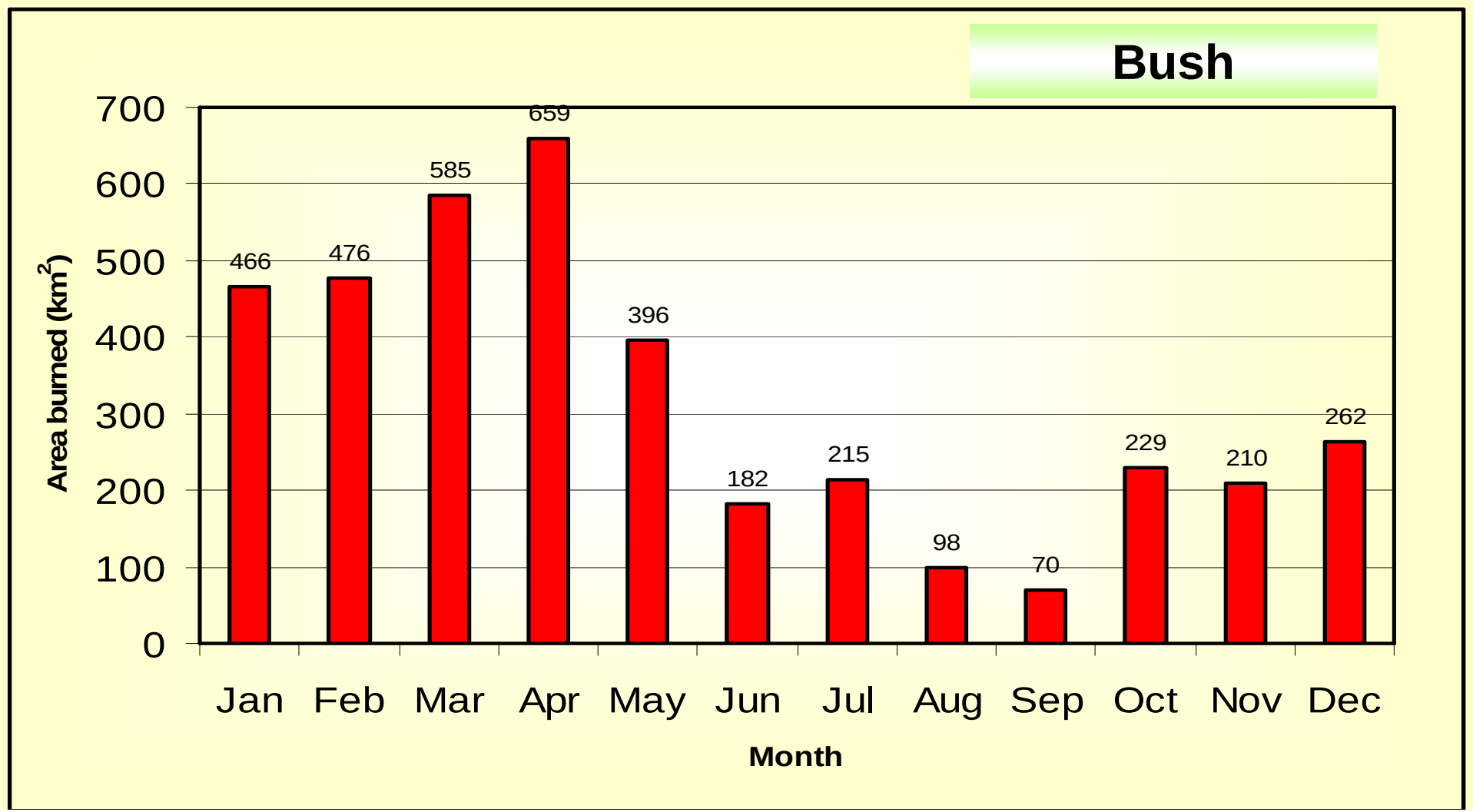


Exercise I: Calculation of Emissions from Biomass Burning in MRBSR in 2002

- **Example of Emission Factors**

Table 5. Emission Factors for Biomass Burning (g kg^{-1})[a]

Vegetation Type	SO_2	NO_x	NMVOC[b]	CO	BC	OC	NH_3	CO_2	CH_4
Savanna/Grassland	0.35	5.98	9.73	65	0.48	3.4	1.05	1613	2.3
Tropical Forest	0.57	2.45	19.32	104	0.66	5.2	1.3	1580	6.8
Extratropical Forest	1	4.6	21.79	107	0.56	9.15	1.4	1569	4.7
Crop Residue	0.4	3.83	15.7	92	0.69	3.3	1.3	1515	2.7

[a]Source: *Andreae and Merlet* [2001].

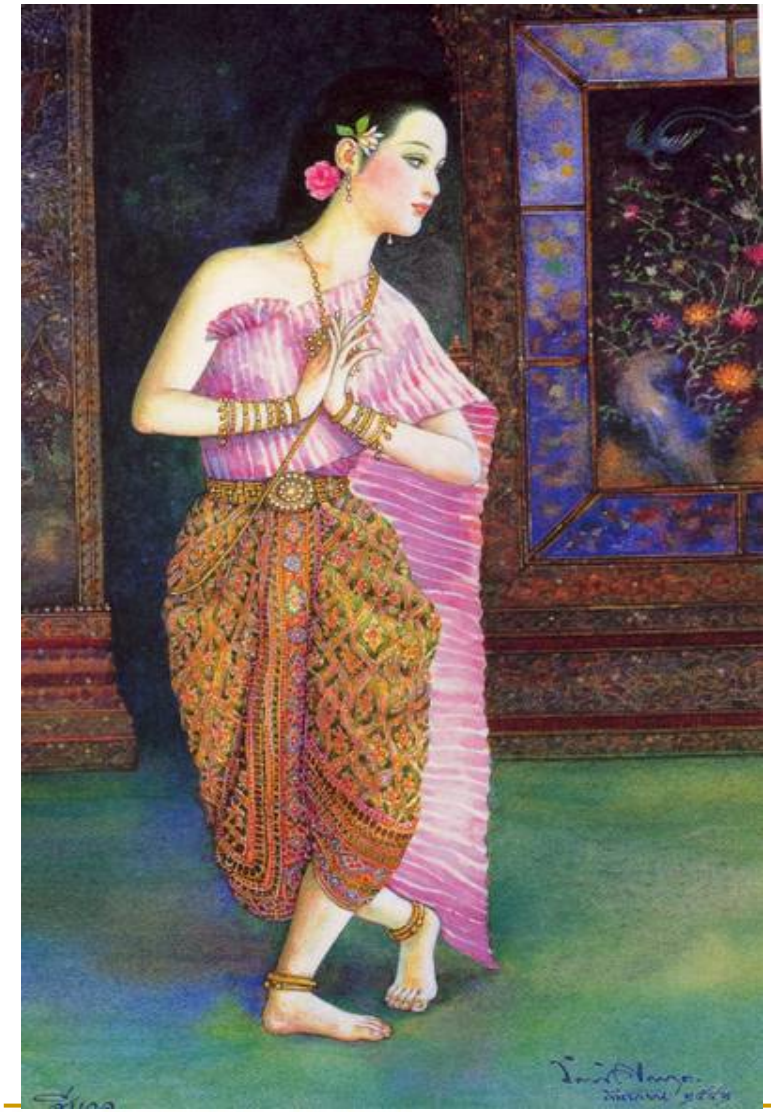
[b]An emission factor for NMVOC was derived by combining the emission factors of many individual NMVOC species from *Andreae and Merlet* [2001].

Streets et al., 2003

Exercise II: Spatial Distribution of Fires in February 2002

- **Materials – Excel Spreadsheet**
  - **Hotspots detected by DMSP-ANDES satellite**
  - **Above ground biomass density of different type of vegetation**
  - **EF (CO_2, CO, CH_4, NO_x, N_2O, TPM)**
- **Output**
  - **Emission map for each of the 4 countries**

Acknowledgements



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