

Project update: Emission factors for category 6A: open burning



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Issues



Outcome of the Experts meeting Melbourne, Dec 2005

The Issue was the >100 fold range in EFs

Are they real or the result of measurement method

- Equipment and operating protocols (lab, field samplers)
- Change in fuel during transport
- Effect of the surface on which the fire occurs (soil, concrete)

The Project:



Measure EFs using

- Different sampling methods
 - field sampler (the woozle)
 - burn hut
- on same fuels
 - in the field
 - transported to the burn hut
 - on soil
 - on inert substrate (bricks)

All up, 26 burn tests

Fuels/fire classes

Sugar cane

(Florida)

Prescribed burning in forests

(Duke Forest, NC)

Project output: Revised EFs

Sampling Systems



Burn Hut



Field sampler



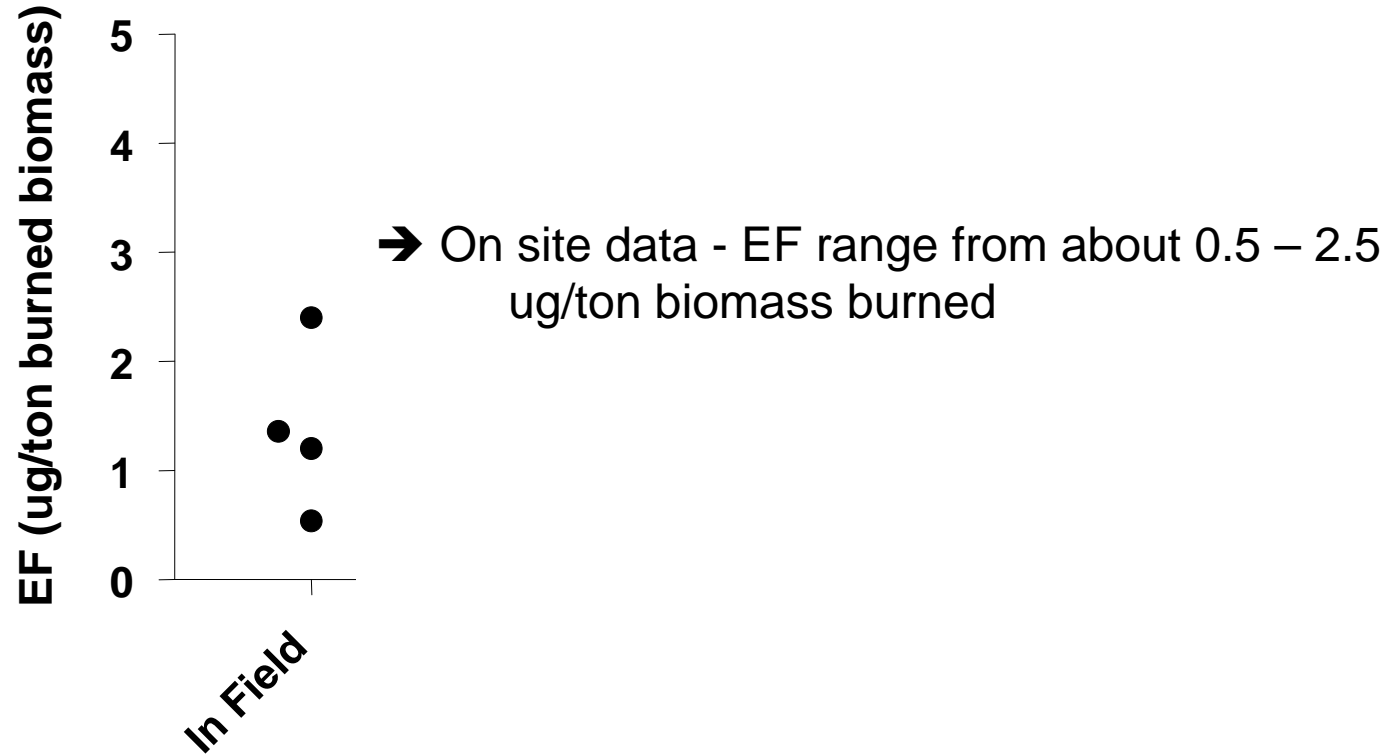
Sugar cane sampling



Sugar Cane



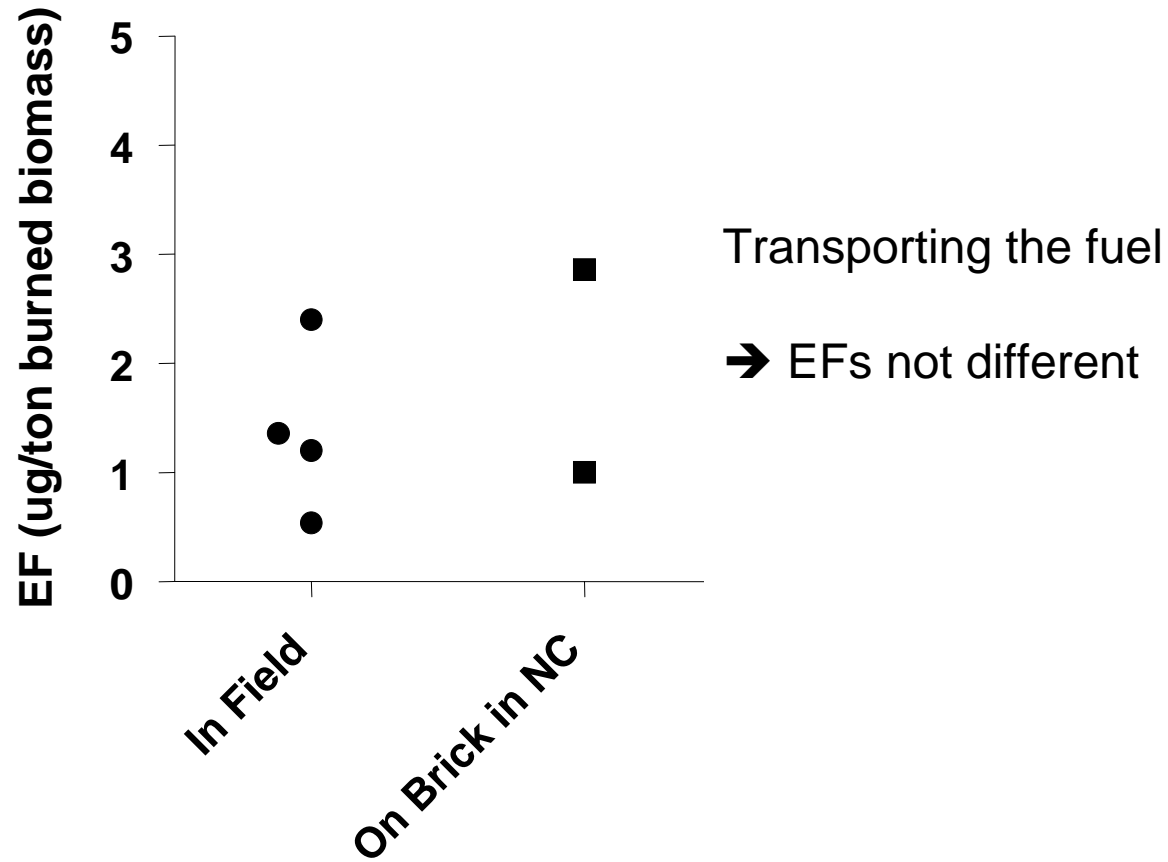
Cane from Florida



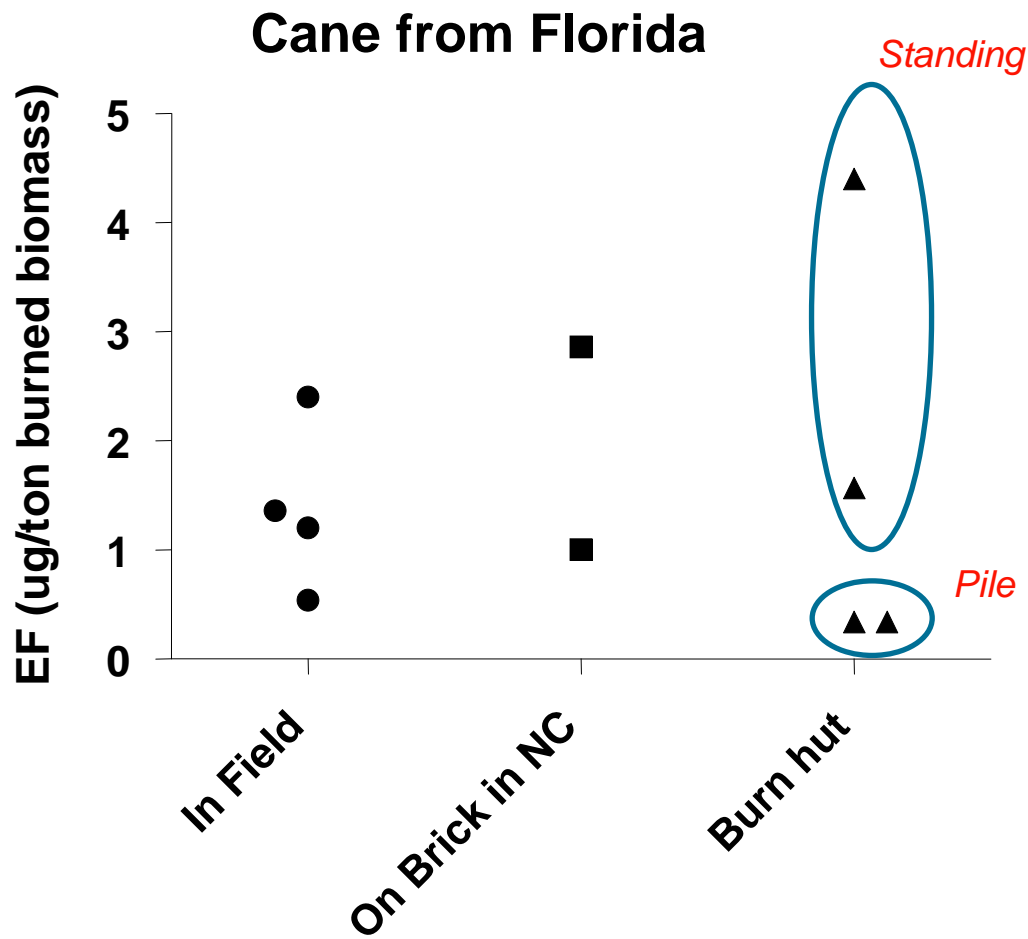
Sugar Cane



Cane from Florida

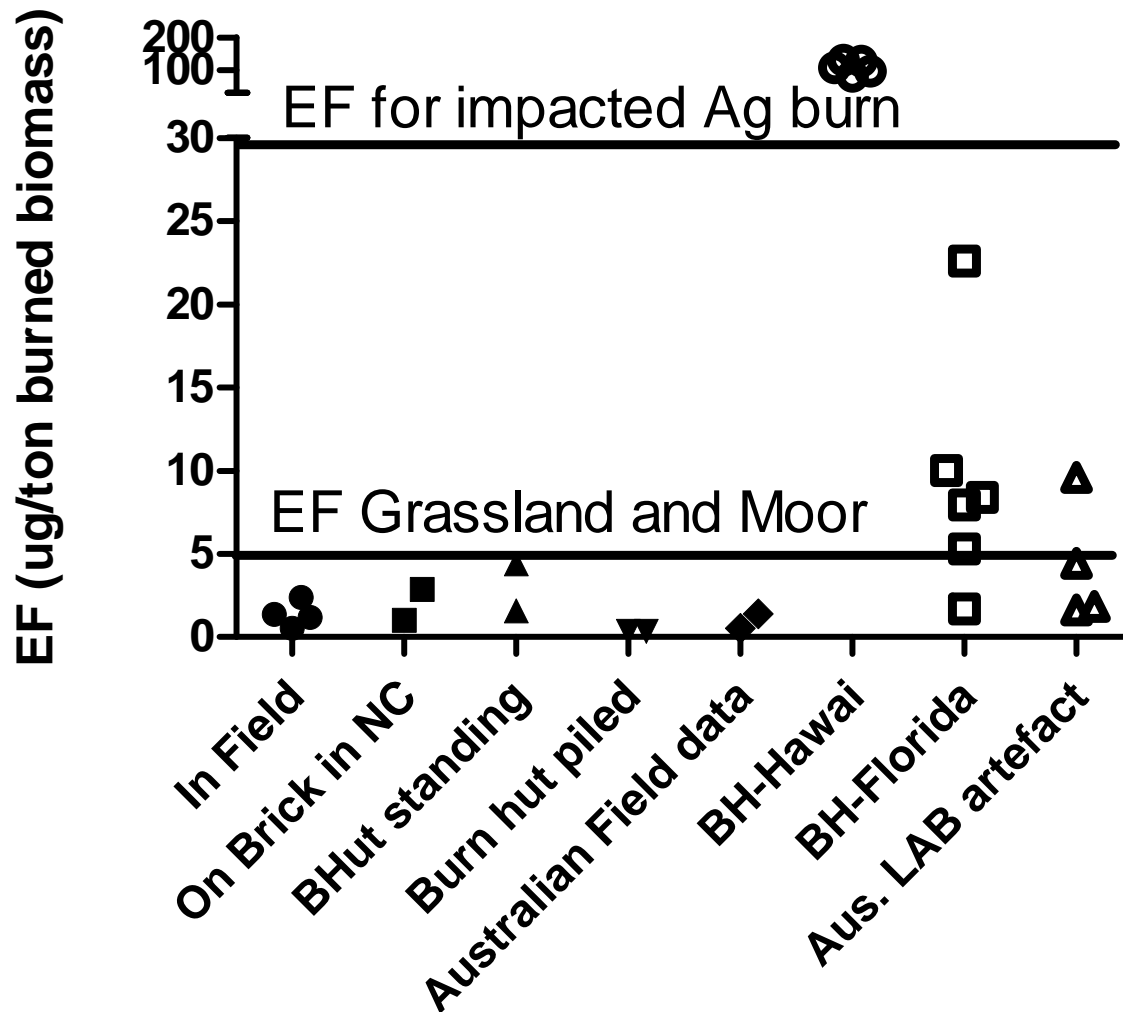


Sugar Cane

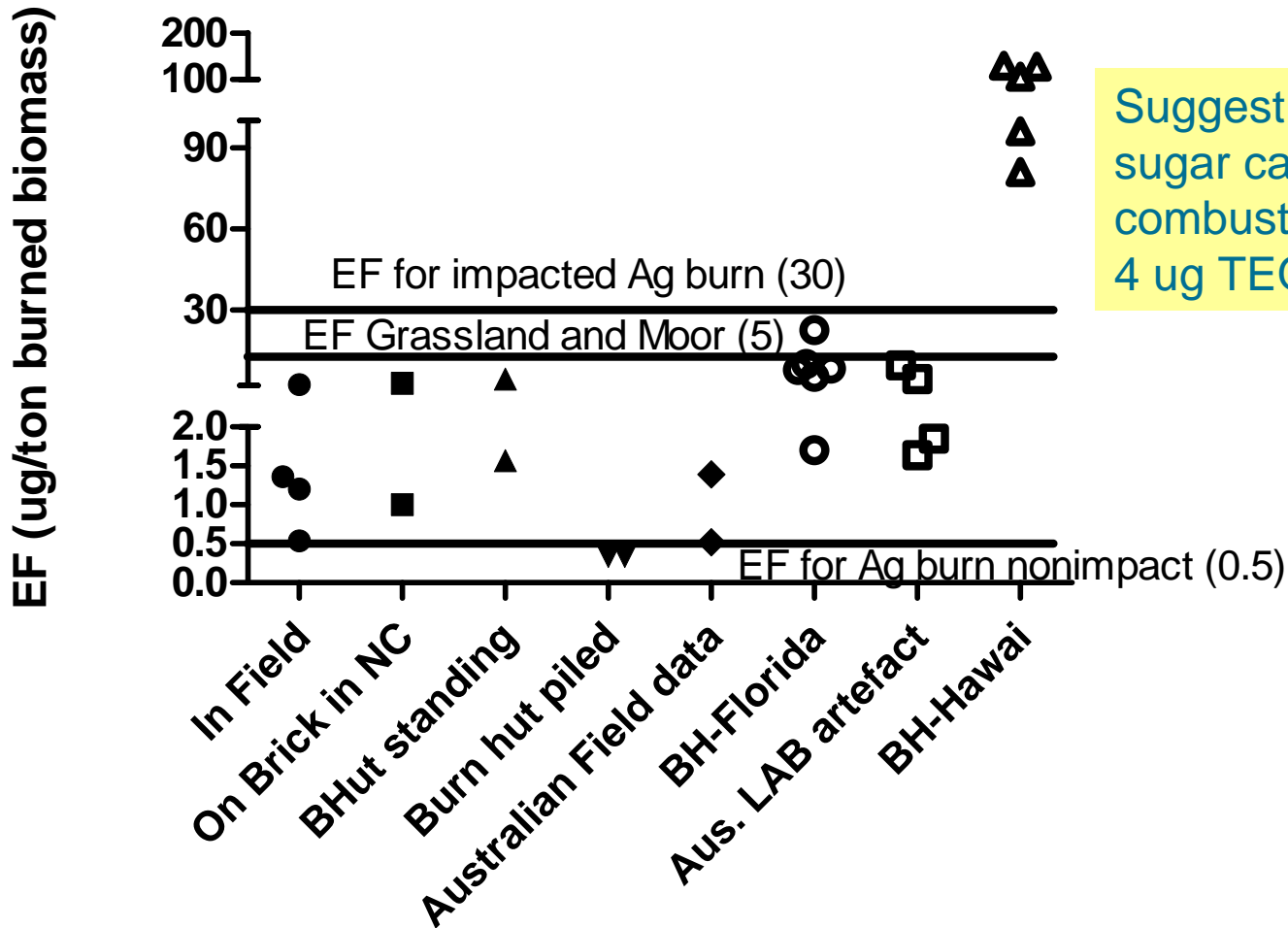


Results between different Methods very similar

Sugar Cane: all data



Sugar Cane: all data



Suggest an EF for sugar cane combustion of 4 ug TEQ/ton burned

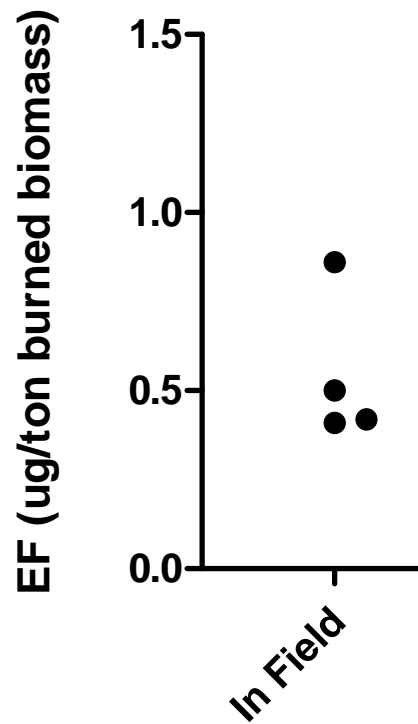
Forest Burns



Forest Burns



Prescribed burns (Duke Forest)



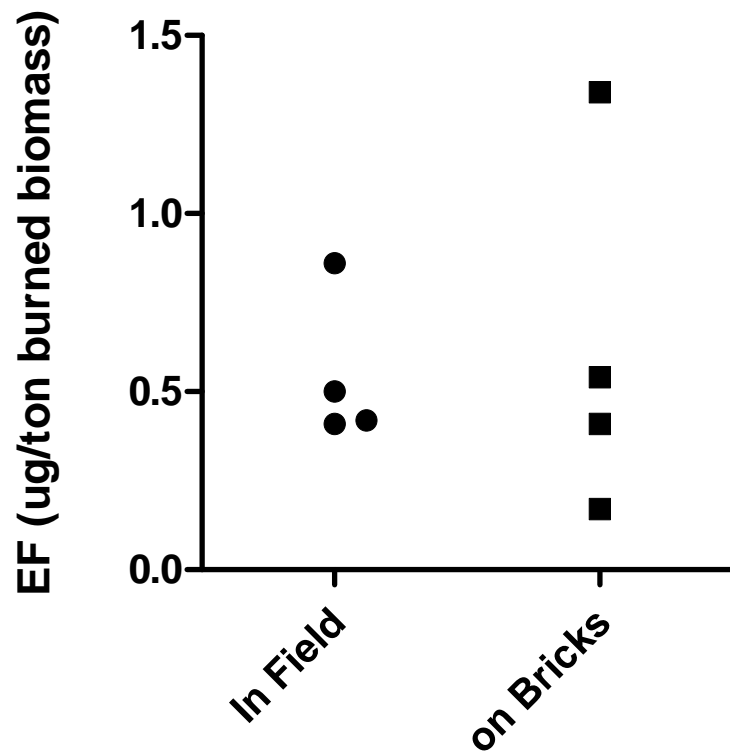
→ On site data

EF range: 0.4 and 1 ug/ton biomass

Forest Burns



Prescribed burns (Duke Forest)



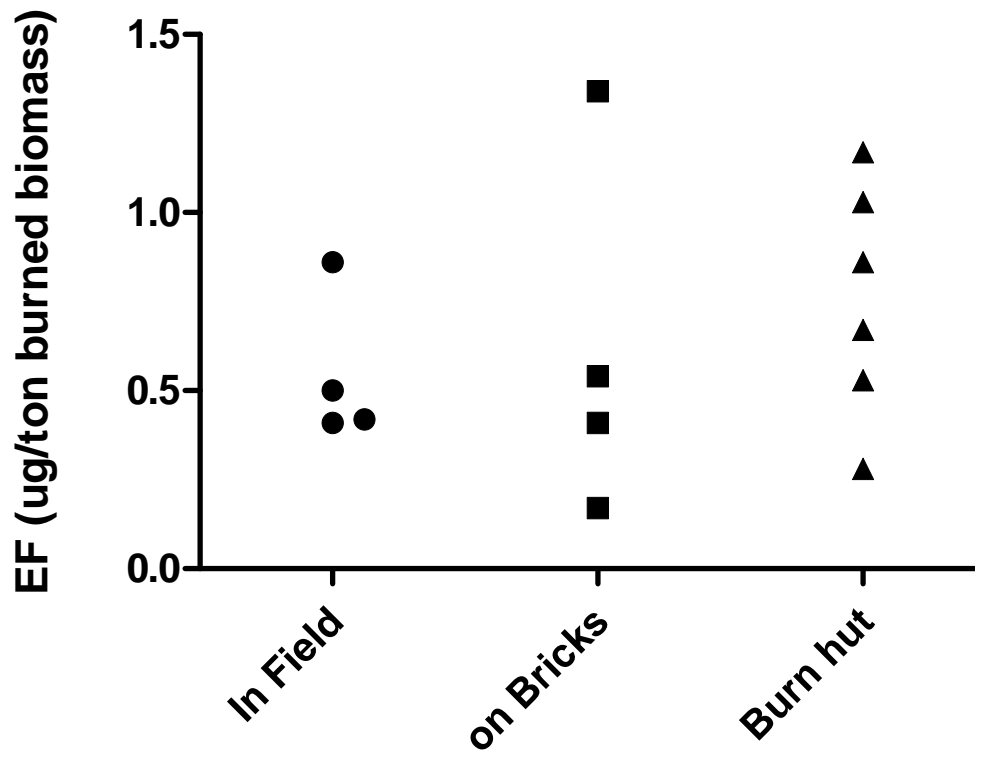
Comparison between in-field and on bricks:

➔ **SIMILAR RESULTS!**

Forest Burns



Prescribed burns (Duke Forest)



Comparison between field samplers and burn hut

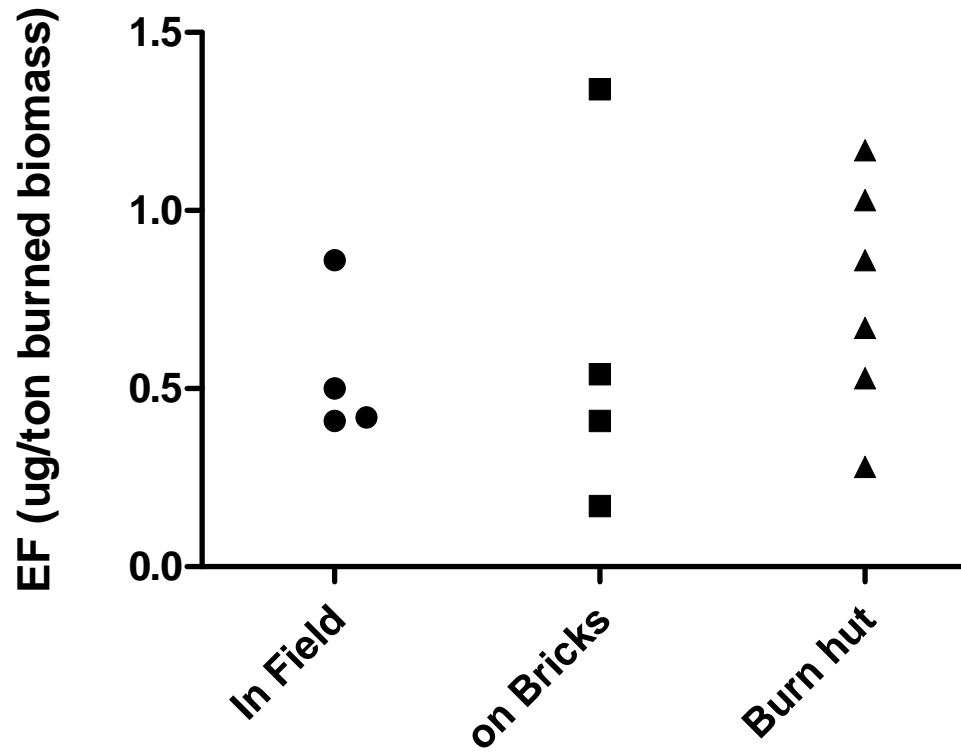
➔ NO DIFFERENCE

➔ MISSION ACHIEVED

Forest Burns



Prescribed burns (Duke Forest)



Comparison between field samplers and burn hut

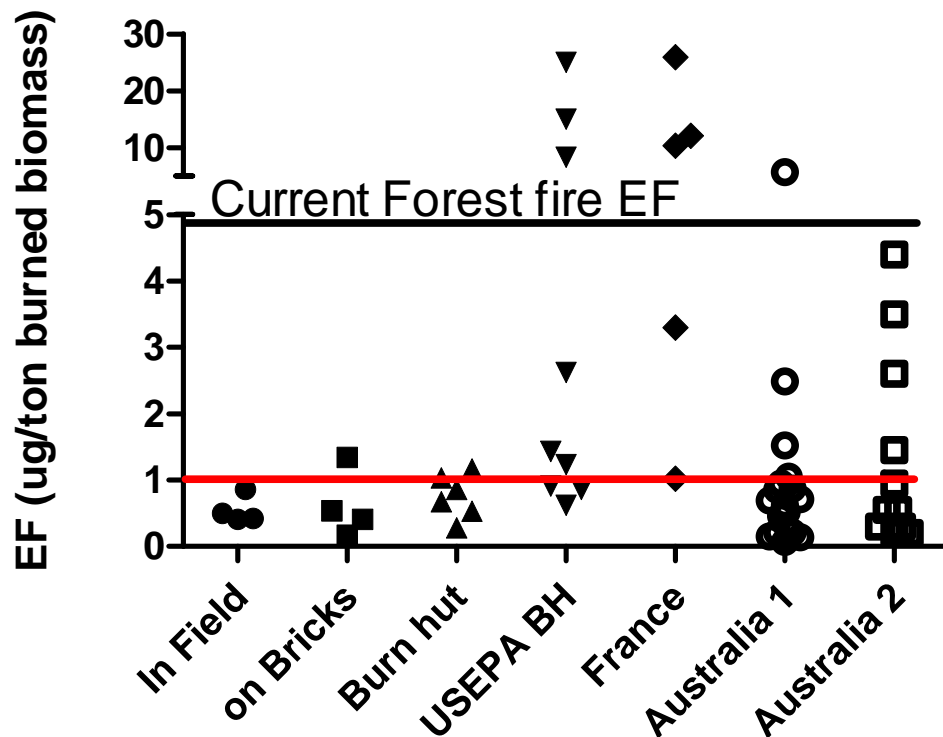
→ NO DIFFERENCE

→ MISSION ACHIEVED

Forest Burns



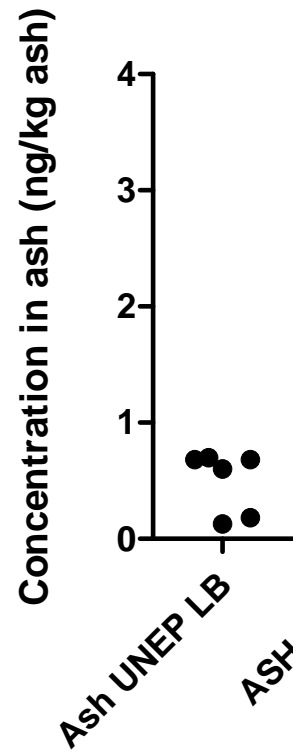
All forest fire data



Median all data: 0.86 ug/ton biomass (though skewed data)

→ Proposed EF 1 ug/ton biomass

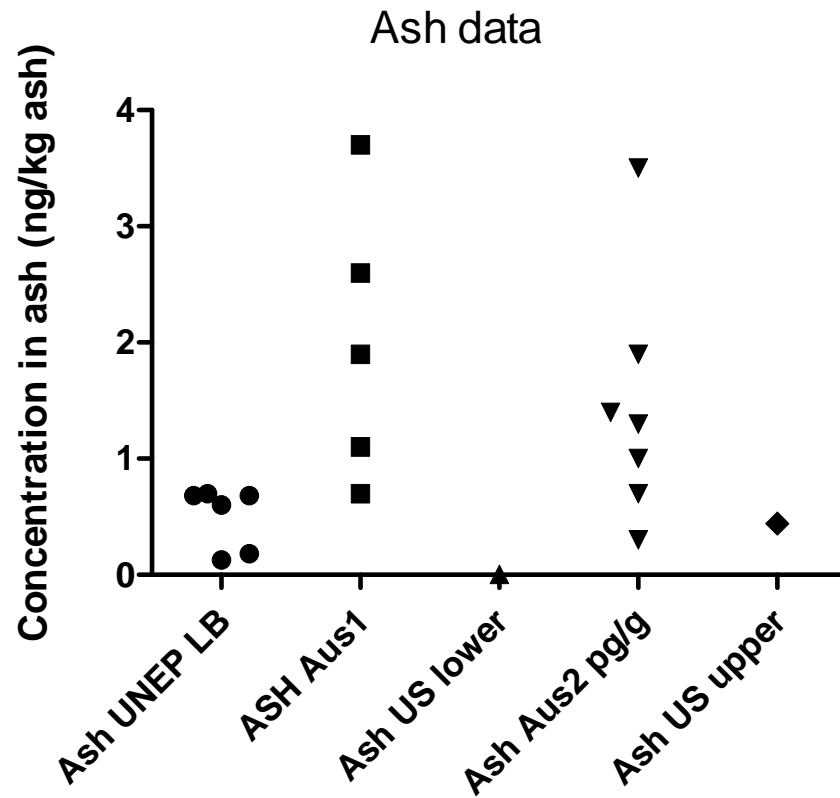
How to tackle emissions to land



→ UNEP data

0.1 – 0.7 ng/kg ash

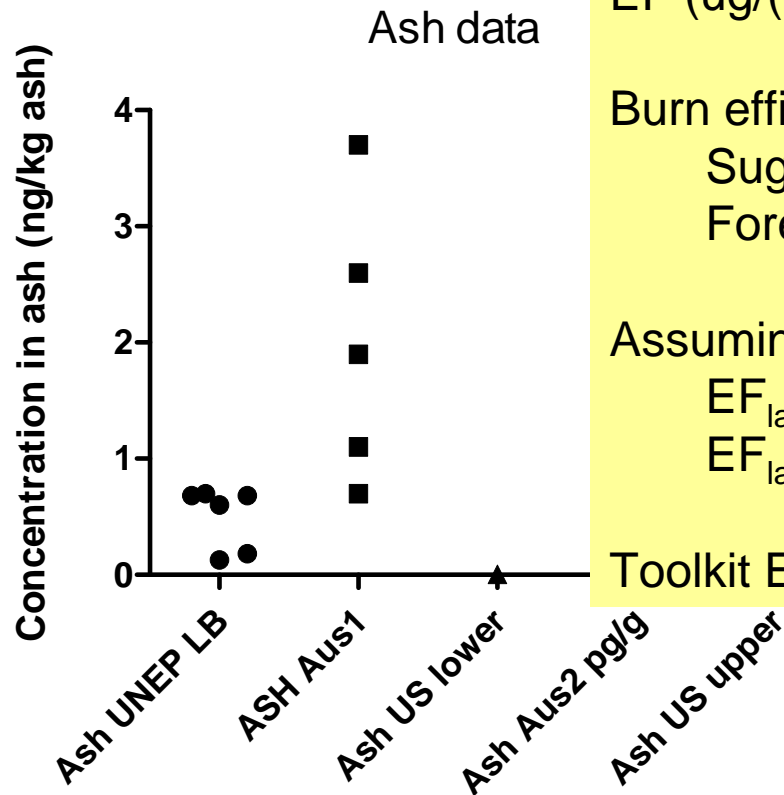
How to tackle emissions to land



→ all data

< LOD – 4 ng/kg ash

How to tackle emissions to land



$$EF \text{ (ug/(ton burned))} = C_{\text{ash}} \times (1 - \text{BurnEff})$$

Burn efficiency

Sugarcane Leave BurnEff: ~ 0.95

Forest fuel BurnEff: ~0.85

Assuming mean Ash conc. of 1 ug/ton ash, Then

$EF_{\text{land}} \text{ Sugar cane} = 1 \times 0.05 = 0.05 \text{ ug/ton}$

$EF_{\text{land}} \text{ Forest} = 1 \times 0.15 = 0.15 \text{ ug/ton}$

Toolkit EF: 4 ug/t and 10 ug/t

Current EFs

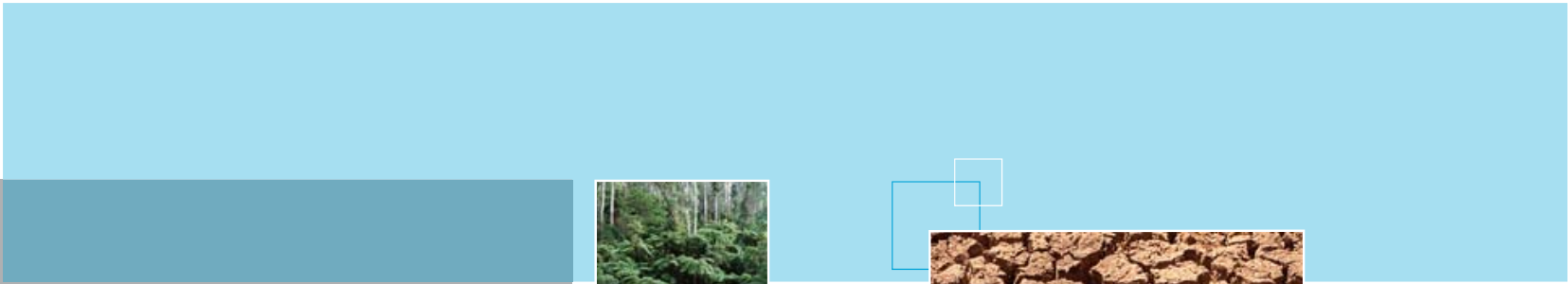


Classification	Emission to air (ug TEQ/t material burned)	Emission to land (ug TEQ/t of Material burned)
Forest Fires	5	4
Grassland and moor fires	5	4
Agricultural residue burning (in the field), impacted, poor conditions	30	10
Agriculture residue burning (in the field), not impacted	0.5	10

Proposed new EFs



Classification	Emission to air (ug TEQ/t material burned)	Emission to land (ug TEQ/t of material burned)
Forest Fires	1	0.15
Sugar Cane Burning	4	0.05
Cereal crop	0.5	0.05
Grassland & Savannah	0.5	0.15



Thank you

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