Soils Research for Sustainable Development of Our Society

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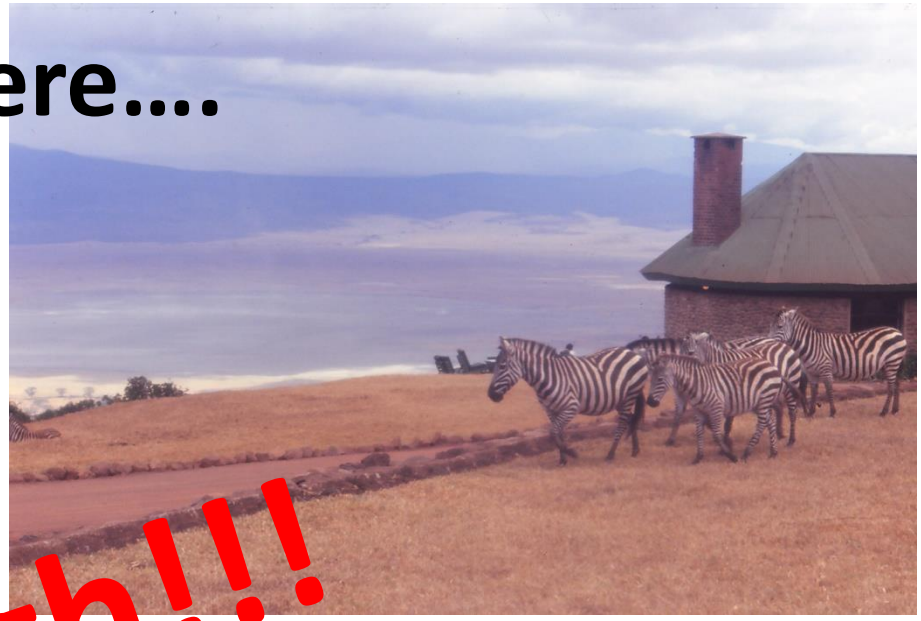
Japan

happy!

Russia

But, not everywhere….



tough!!!

Soil Degradation:
Threat to Human Security

Two aspects of human security:

- freedom from fear
  (environmental destruction)
- freedom from want
  (famine)

(Kofi Annan, 2000)

Soil Degradation:

Soils aspect of land degradation

(mainly induced by human activities)

Major Soil Degradation Processes:

Physical processes

deterioration of soil structure
soil densification
adverse hydro-thermal regime

Chemical processes

leaching, acidification
salt accumulation

Biological processes

organic matter decomposition
reduction of soil fauna
increase in soil-borne pathogens

Causes of Soil Degradation:

Natural causes

soil depth, clay minerals type, texture

Anthropogenic causes

farming systems

deforestation, tillage method, rotations,

agri-chemicals, erosion control, pest management

socio-economical

land tenure, property right, legislation

Is “shifting cultivation” causing soil degradation in monsoon Asia?

(Northern Thailand)

1. Background and Objectives

Shifting cultivation:

traditionally sustainable or causing land degradation?

Role of fallowing :

1) mechanism (recovery of C and other nutrients)

2) how long? (for sustaining system)

2. Study site

Location: ★
Ban Du La Poe,
Northern Thailand
Elevation:
1,200 m
Av. Temperature:
20.4 ℃
Ann. Precipitation:
1,200 mm
Wet: Apr.-Nov.;
Dry: Dec.-Mar.
Land use:
shifting cultivation
Vegetation:
evergreen forest
Soil:
Ustic Haplohumults

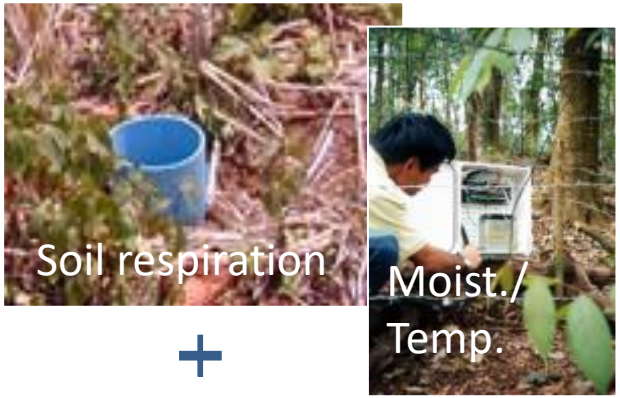
3. Methods

3.1 Field plot setup

3.2 Monitoring and estimation

1) C input

2) C output



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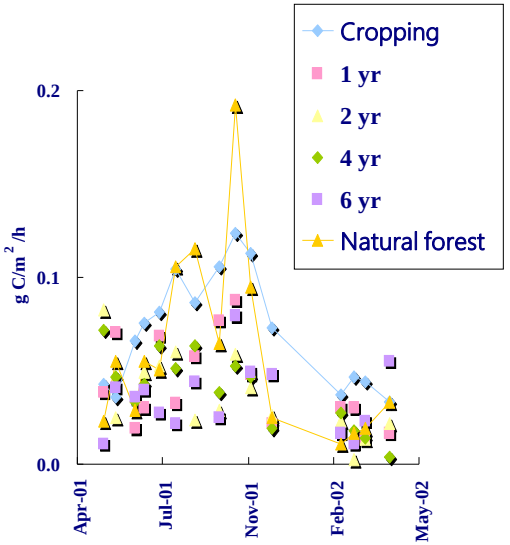
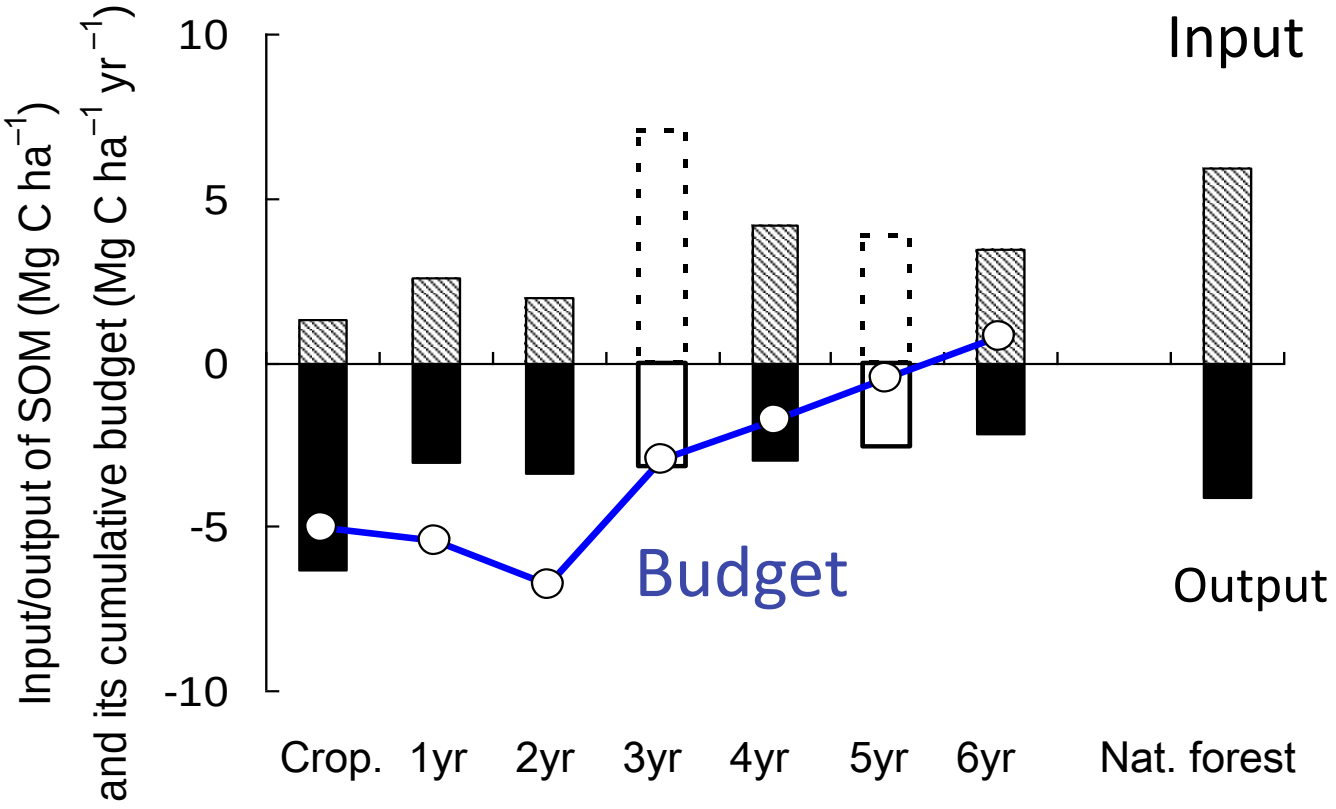


Soil respiration=A(moist.)^{b}exp{-a/R(temp.)}exp(cD)

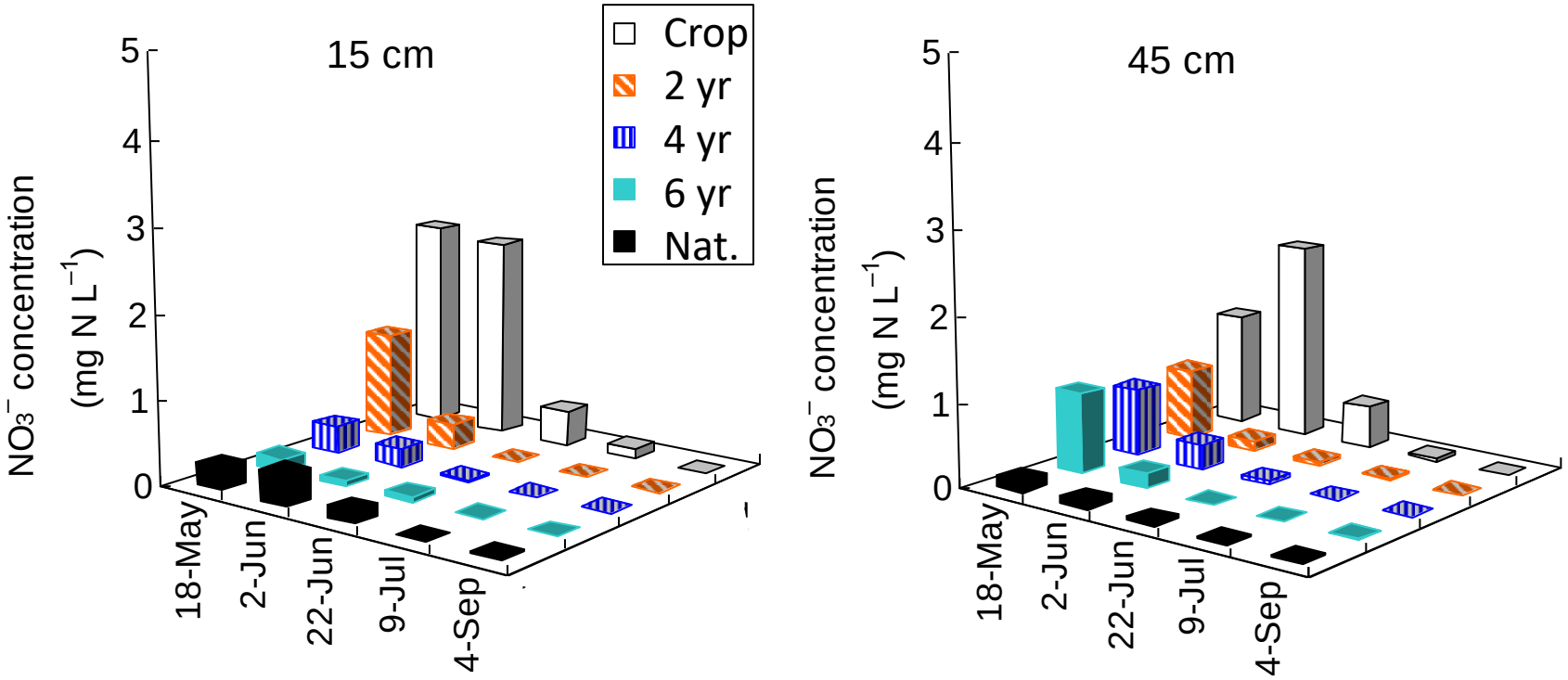
4. Results

4.1 C input/ output/ cumulative budget



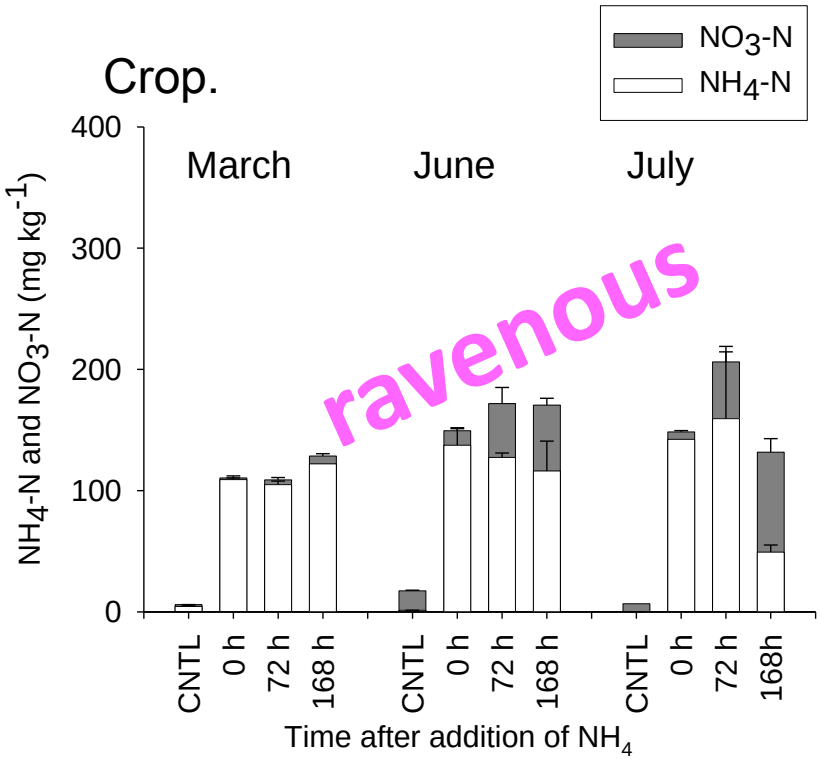
Fallow: recovery of C lost when cropping

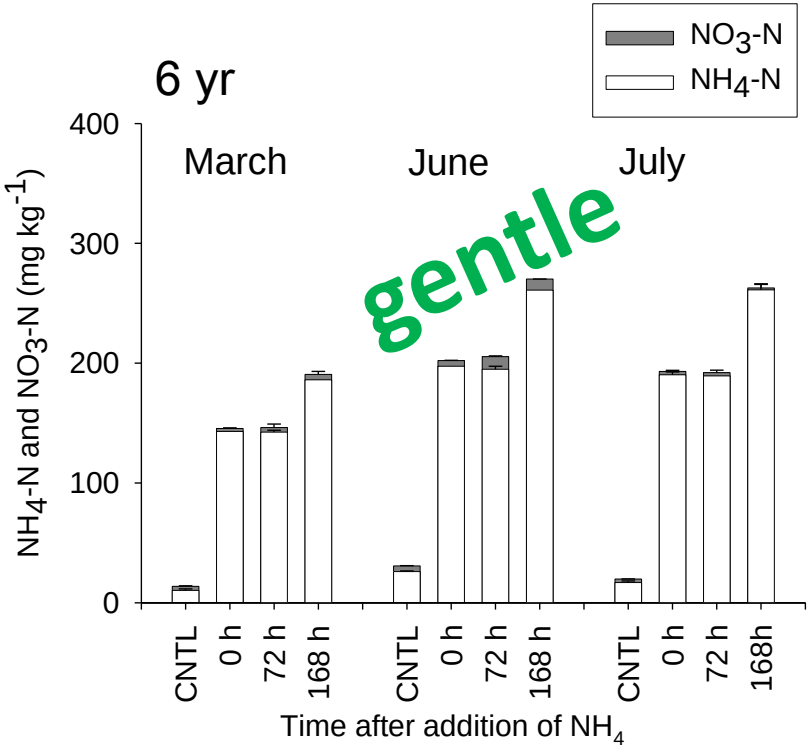
4.3 NO_3^- in soil solution



Fallow: Reducing nitrate leaching

4.4 Short-term transformation of NH_4–N added to the fresh soils (168 hrs, 25C, aerobic condition)

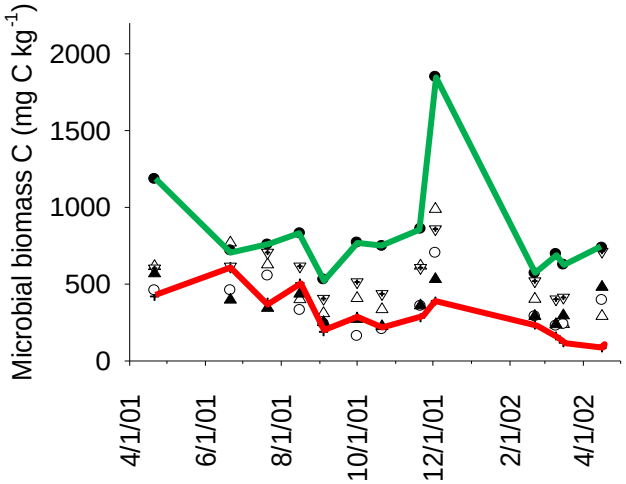




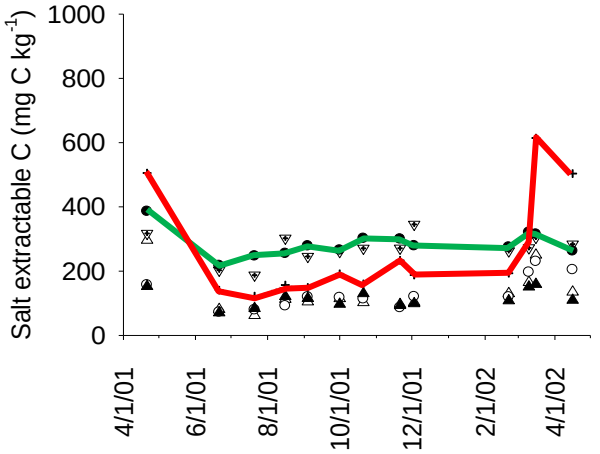
Fallow: Low nitrification, low NH_4-N assimilation

4.5 Mechanism

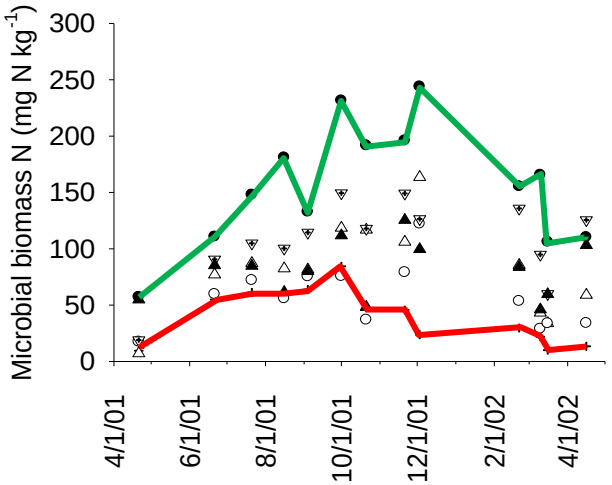
Microbial biomass C (alive)



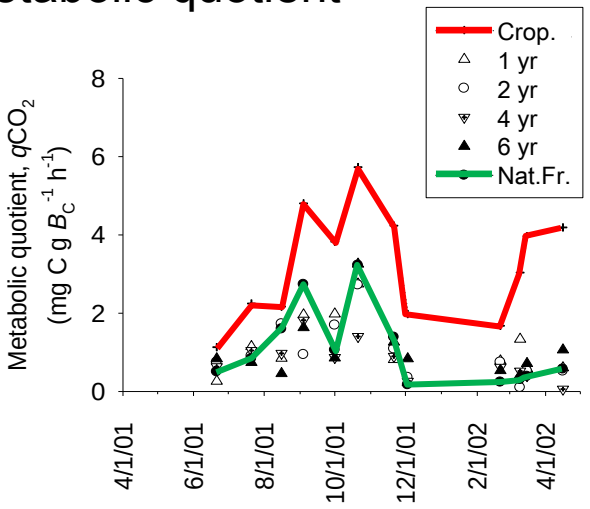
Salt extractable C (dead)



Microbial biomass N (alive)



Metabolic quotient



Fallow: Reduce in microbial activity

5. Conclusions

1) Soil carbon lost in the cropping stage is restored by the litter input in the fa
of 6 to 7 years.

Mechanism includes

2) addition
th
nd N loss
y)
ccession of the soil microbial community
from rapid consumers
to stable and slow utilizers of SOC

Shifting cultivation is sustaina
But ...

Can they keep this system?
If they refuse to do so?
Is there any alternative?

How do we control soil degradation and conserve ecosystems?

1) We need knowledge and technology.

2) We need legislation.

and ……

3) We need philosophy.

Aldo Leopold

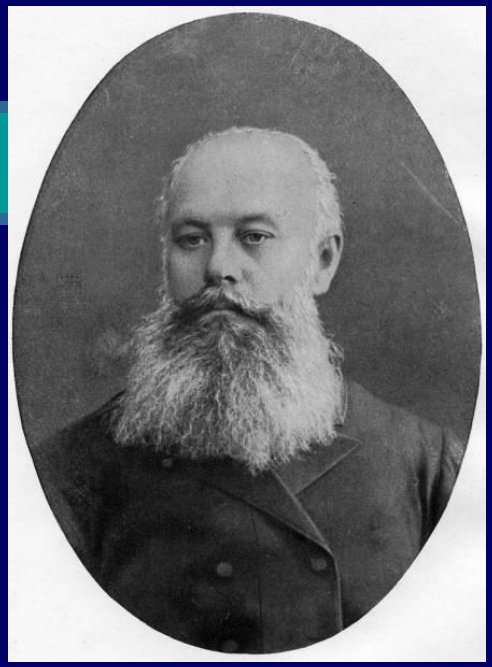
Sand County Almanac (1949)

"Land Ethics"

"A thing is right only when it tends to preserve the integrity, stability, and beauty of the community, and the community includes the soil, water, fauna, and flora, as well as the people."

International Decade of Soils

2015-2024



5 soil forming factors

+ 1 (human beings)

new knowledge,
new technology,
new ideas, and
new philosophy and action


In “Anthropocene”
our soil resources and society
are at your mercy.
So, be gentle and wise with
stewardship responsibilities.
Thank you for your attention and
let us behave ourselves together.