Soil - Monitoring — What we learnt?

● There are various & many GHG mitigation options

> *Importance of management*
> *Human impacts > natural variations*

Soil - Monitoring   What we learnt?

● There are various & many GHG mitigation options

> ➢ *No ~ reduced tillage,*
> ➢ *Organic matter input (residues, roots, manures),*
> ➢ *Increasing N use efficiency (slow release fertilizers, nitrification inhibitors, **low N input & high yield**),*
> ➢ *Surface & subsurface drainage (woodchip underdrain, mid-season aeration),*
> ➢ *Undersurface heat exchange, etc.*

● Fortunately, these options are mostly consistent with technologies for **sustainable** agriculture & crop production **efficiency** improvement

Soil - Monitoring　　Research Gaps

- Measurements or mechanisms ↔ Models

- Low N input (simple & most important) ↔ "Optimum" N application rate?

- High cost options ↔ Low mitigation potential (in Japan)

- "Steady-state world" options ↔ "Unsteady-state world" options

Soil - Monitoring	Research Gaps

● "Steady-state world" options

Surface & subsurface drainage, Mid-season aeration, Slow-release fertilizer, Nitrification inhibitor, etc.

● "Unsteady-state world" options (effective over centuries or only decades?)
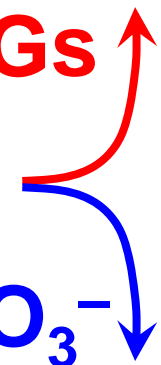
Manure application, Wood chip underdrain, Fallow conditions after paddy field, etc.

GHGs

$$○○ \text{ Mg CO}_2\text{eq/ha/yr}$$ Constant ?

NO$_3^-$

Soil - Monitoring   Research Challenges

● *Connecting field soil & plants monitoring research with mechanism & model research*

● *Connecting field monitoring & modeling research with farmers & social economic research*

● *Evaluate the other large benefits derived from sustainable agriculture & efficiency increase*

● *Develop and continue long-term soil & plants monitoring & modeling research network*

Soil - Monitoring | Research Challenges

●*Connecting field soil & plants monitoring research with mechanism & model research*

●*Connecting field monitoring & modeling research with farmers & social economic research*

●*Evaluate the other large benefits derived from*

…and we have to propose appropriate way how human life & society structure should be changed, as long as the "unsteady-state world options" are effective.