

Summer course 2013 report

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# **SUSTAINABLE AGRICULTURE SYSTEM TO SAVE OUR EARTH**

13AM202R  
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## **Introduction**

We went to Indonesia for a week as part of summer course. This summer course aimed to understand regional sustainability by means of multifaceted research of sustainable agriculture. We took plenary lectures and conducted our presentation on our research, field practices, laboratory works, technical tours and group discussion in regard to sustainable agriculture. To know the sustainability of the forest and farming area in social, economic, farmer and environment, we analyzed soil, water and leaf.

## **Materials and methods**

### *Soil analysis*

Soil samples were collected from twelve distinct sites across walat mountain forest in Indonesia {Agroforestry(upper, middle, lower), Forestry(upper, middle, lower), Wet land/paddy field(upper, middle, lower), Dry land/cacao plant(upper, middle, lower)}, and 10 different sites across IPB university forest (under the C.pubescent, elephant grass, shorgum, butter nut, long bean, paria, cacao, rubber tree, oil palm and coffee). We measured soil pH, ammonium ( $\text{NH}_4\text{-N}$ ), nitrate ( $\text{NO}_3\text{-N}$ ), phosphate ( $\text{P}_2\text{O}_5$ ), kalium ( $\text{K}_2\text{O}$ ), calcium ( $\text{CaO}$ ), magnesium ( $\text{MgO}$ ) using the Dr.soil according to the manufacturer's instructions.

### *Water analysis*

Water samples were collected from twelve distinct sites across walat mountain forest in Indonesia (same as soil samples). We measured pH, ammonium ( $\text{NH}_4\text{-N}$ ), nitrate ( $\text{NO}_3\text{-N}$ ), phosphate ( $\text{PO}_4$ ), kalium ( $\text{K}_2\text{O}$ ), alminium (Al) using the Pure water analysis reagent according to the manufacturer's instructions.

### *Leaf analysis*

Leaf samples were collected from twelve distinct sites across walat mountain forest in Indonesia (same as soil samples), and 10 different sites across IPB university forest (same as soil samples). We measured leaf chlorophyll contents using the the SPAD analysis kit according to manufacturer's instructions.

## **Results and dissections**

### *Soil contents*

Wetland and kampus showed low pH, Low pH (acidic soil) is not good for plant growth (Fig. 1a). The soil of wetland showed high concentration of  $\text{NH}_4\text{-N}$  (Fig. 1b). High concentrated  $\text{NH}_4\text{-N}$  cause the increase of green gas emmision, like  $\text{N}_2\text{O}$ . The  $\text{NO}_3\text{-N}$

concentration was high in dryland and wetland(Fig. 1c). It also cause increase of N<sub>2</sub>O emmission and eutrophication.

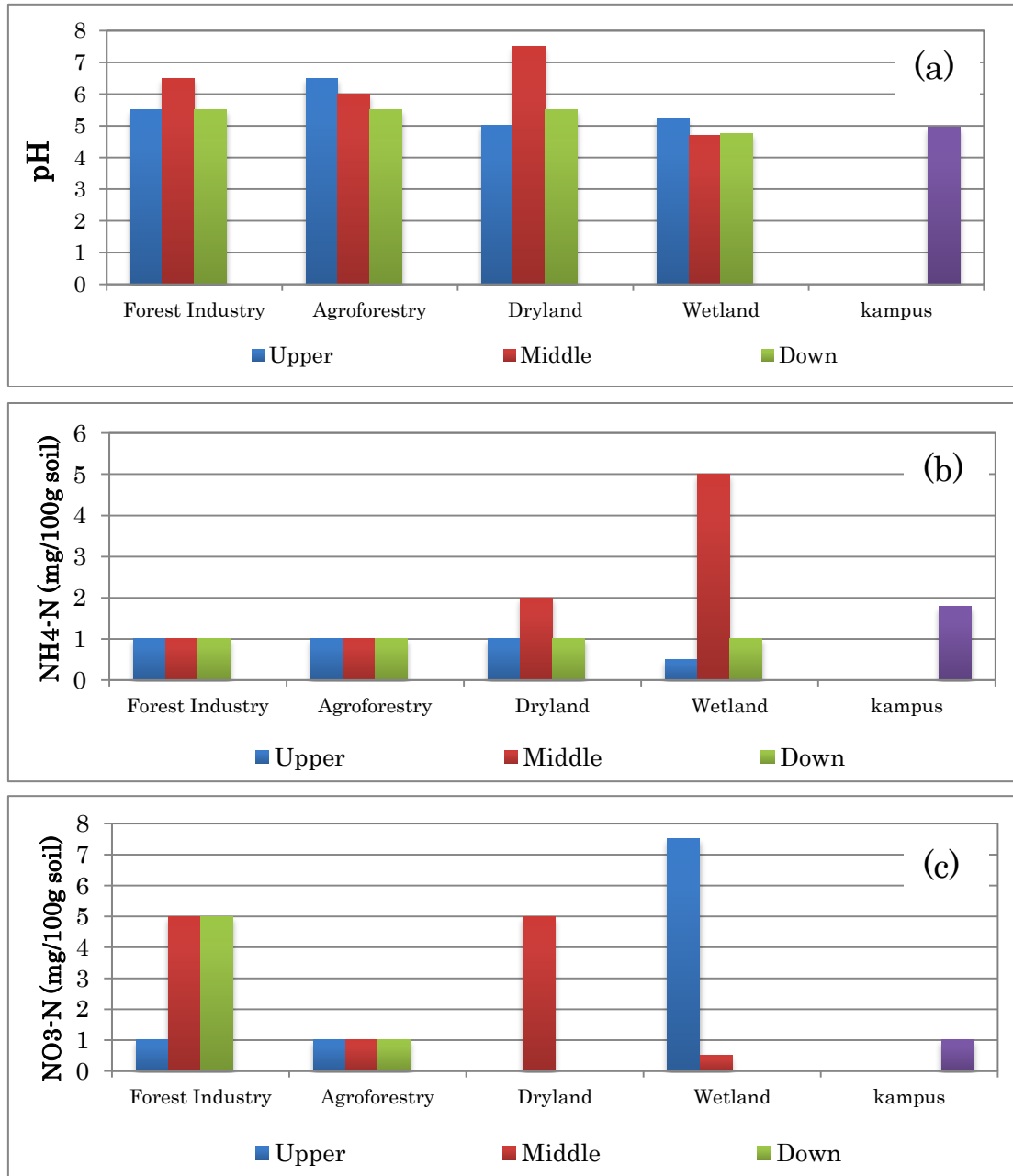


Fig.1. Soil pH(a), ammonia(b), nitrate(c) in walat mountain forest {Agroforestry(upper, middle, lower), Forestry(upper, middle, lower), Wet land(upper, middle, lower), Dry land(upper, middle, lower)}, and IPB university forest(kampus). Kampus value is average.

*Water contents*

Most samples show low ammonium concentration (<Low limit), but Paddy field shows high ammonium concentration (>Upper limit) (Fig. 2a). From nitrate analysis, most samples were less than lower limits, but Up and Paddy field showed slightly higher than it. Paddy field were used much fertilizer and filled with water, fertilizer contains much nitrogen (mainly  $\text{NH}_4\text{-N}$ ) and paddy field is anaerobic condition by water. Ammonia oxidation need the oxygen, so much ammonia remains in paddy field.

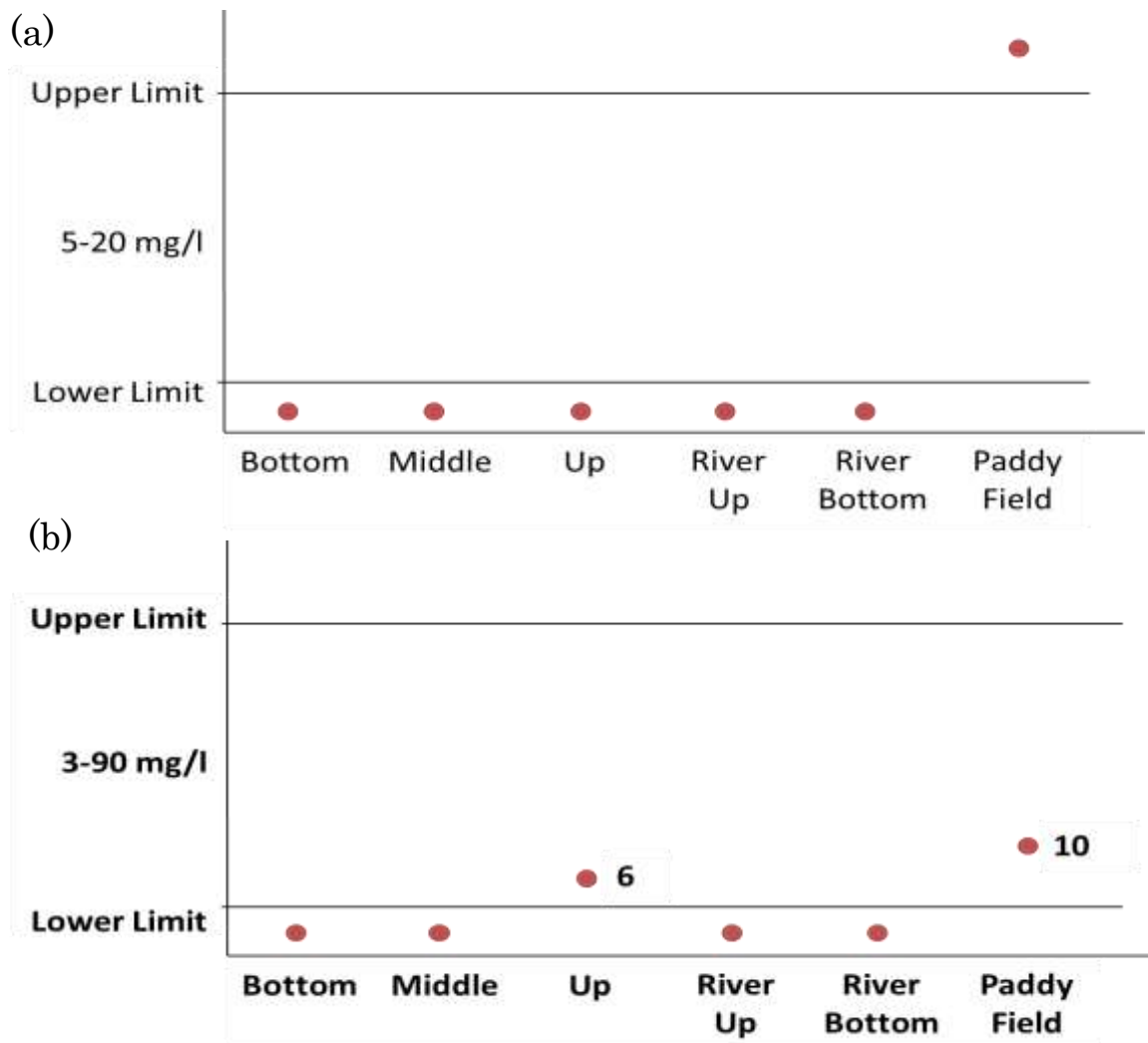


Fig. 2.  $\text{NH}_4^+$  content(a) and  $\text{NO}_3^-$  content(b) in the water in different location.

### Leaf chlorophyll contents

Mostly, young leaf is lower chlorophyll contents than old and middle leaf. Difference between sampling sites were not detected. Each plant may have enough chlorophyll contents.

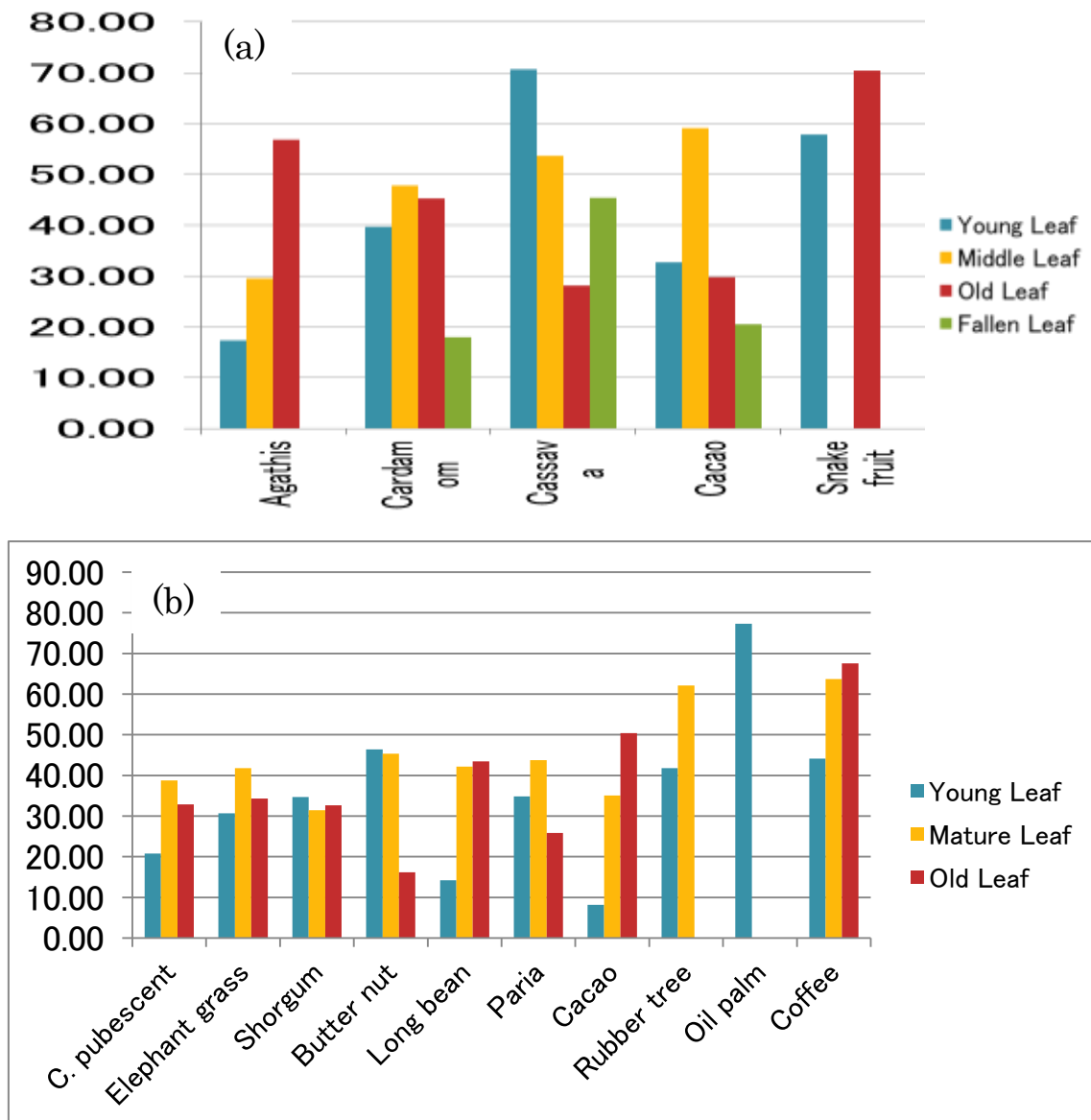


Fig. 3. Chlorophyll contents.(a) Gunung Walat, (b) IPB university farm.

### Conclusions

In Gunung Walat, forestry and agroforestry were more sustainable than cacao plant and paddy field. But, IPB university farm shows sustainable as well as forestry and agroforestry. So it is important for sustainability to perform appropriate management.