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**Bio-fortification of rice grain:
*A case study in Sarawak using calcium
silicate and organic fertiliser***

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Interesting and Fun Facts on Rice

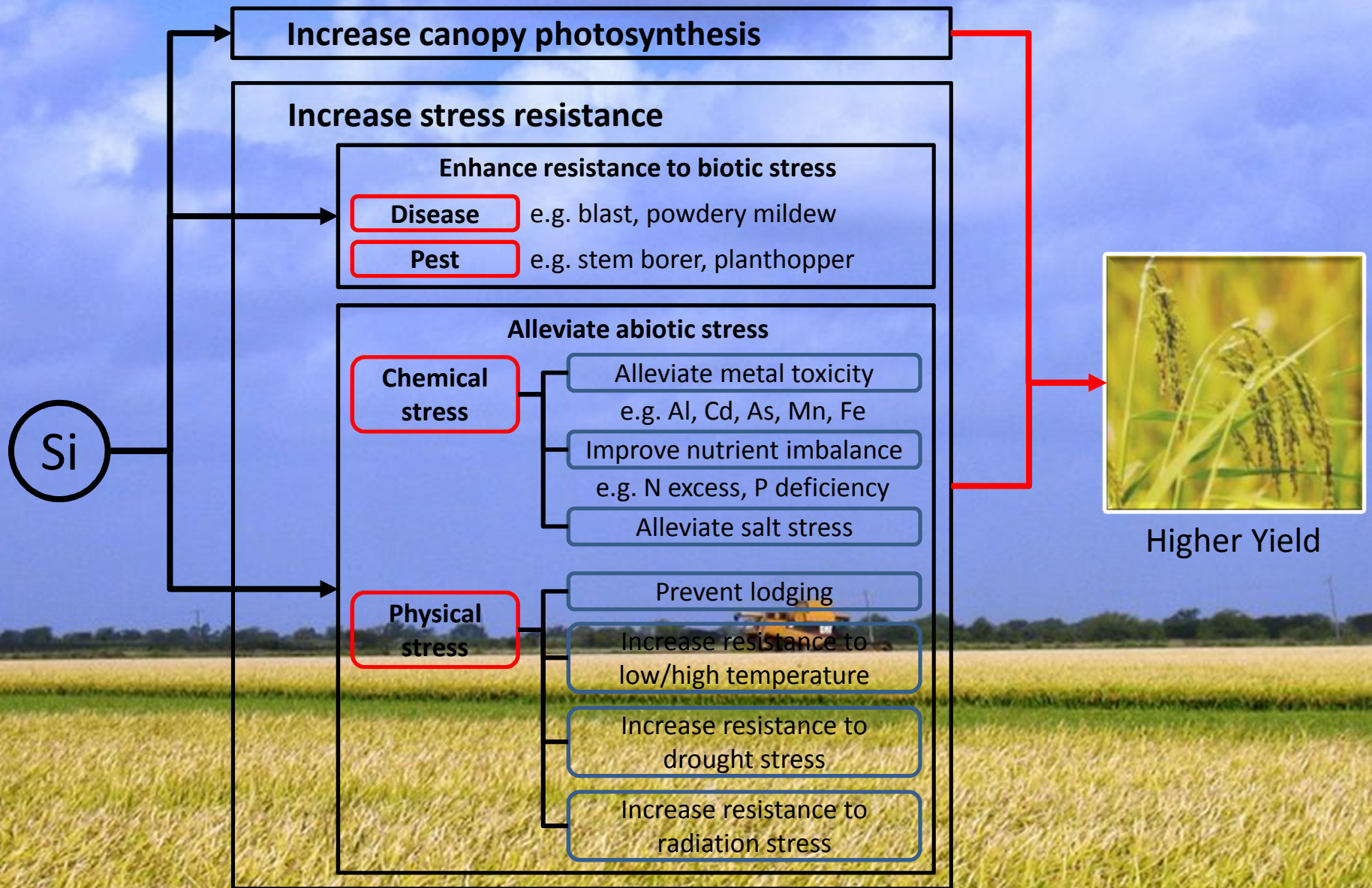
- A typical greeting in Bangladesh, China & Thailand – “**Have you eaten your rice today?**”
- Honda means “main rice field”
- Toyota means “bountiful rice field”
- Japanese word for cooked rice = meal
- In Japanese - Breakfast, lunch & dinner = asa gohan (morning rice), hiru gohan (afternoon rice) & ban gohan (evening rice)
- In Lao PDR & Thailand, eating rice = eating food

Is there a short-cut to increase yield and nutritional quality in rice?

- Breeding **IS** the way forward – ***but it is time consuming***
- Many studies have reported the beneficial effects of CaSi on yield in rice – ***but nutritional quality always overlooked***
- No comprehensive study in Sarawak yet.



Beneficial effects of silicon on plant growth in relation to biotic and abiotic stresses. *TRENDS in Plant Science*. 11(8)



Calcium :

both versatile nutrient and specific signal

- participates in metabolic processes of other nutrients uptake
- promotes proper plant cell elongation
- strengthen cell wall structure
- participates in enzymatic and hormonal processes
- helps in protecting the plant against heat stress
- helps in protecting the plant against diseases
- affects fruit quality
- has a role in the regulation of stomata
- has a direct role in photosynthesis

Objective

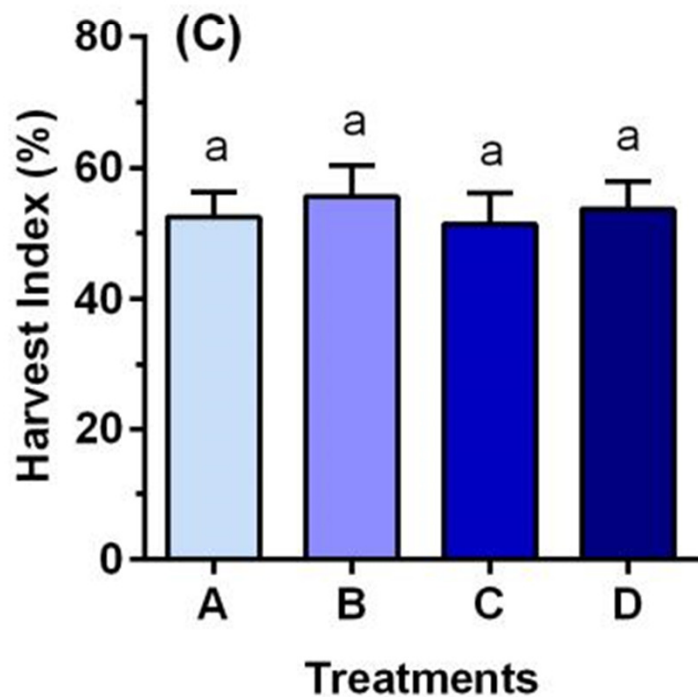
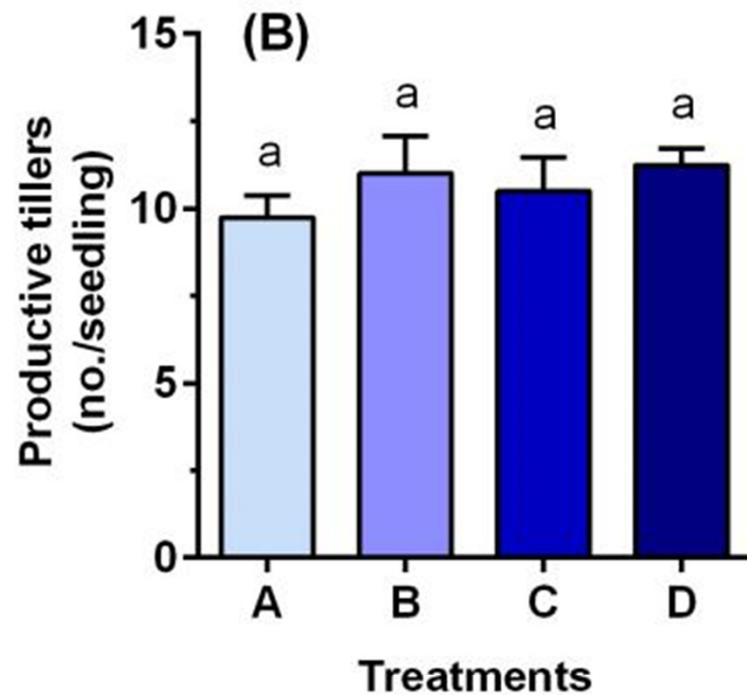
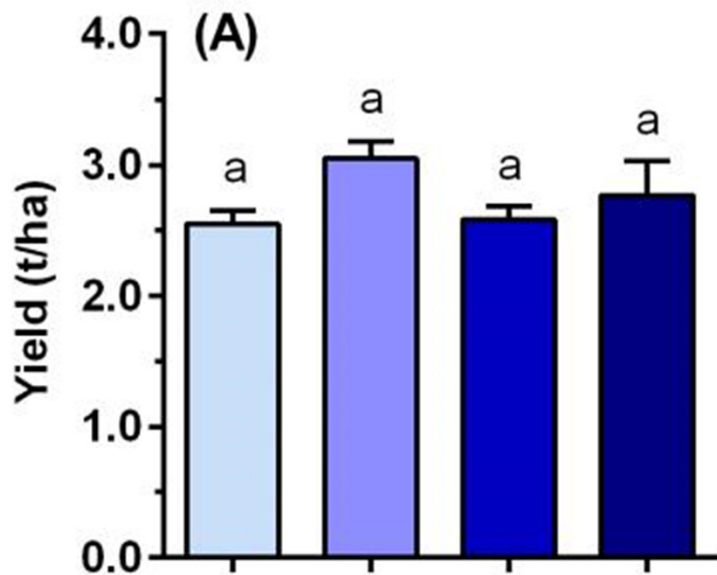
- To compare impact of GML, CaSi and OF on grain yield and nutritional quality in rice.



Materials and Methods

- Variety Ukong was used as a test plant
- Trial was laid down at Paya Paloh, Samarahan
- 4 treatments (1 t/ha GML, 1.36 t/ha CaSi, 1.76 t/ha CaSi and 2.16 t/ha organic fertiliser)
- 4 replicates arranged in RCBD
- ***Prices of the fertilisers :***
 - GML = RM 0.36/kg
 - CaSi = RM 8.28/kg
 - Organic fertiliser = RM 2.64/kg

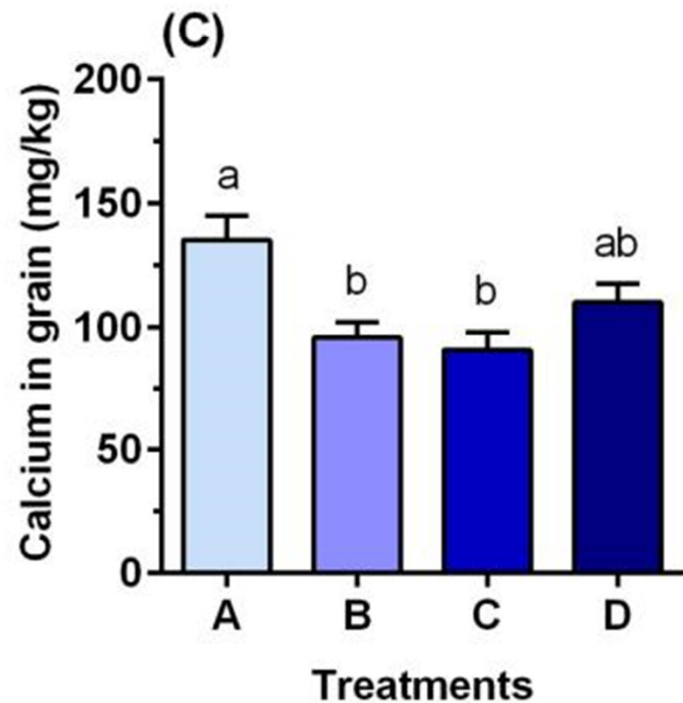
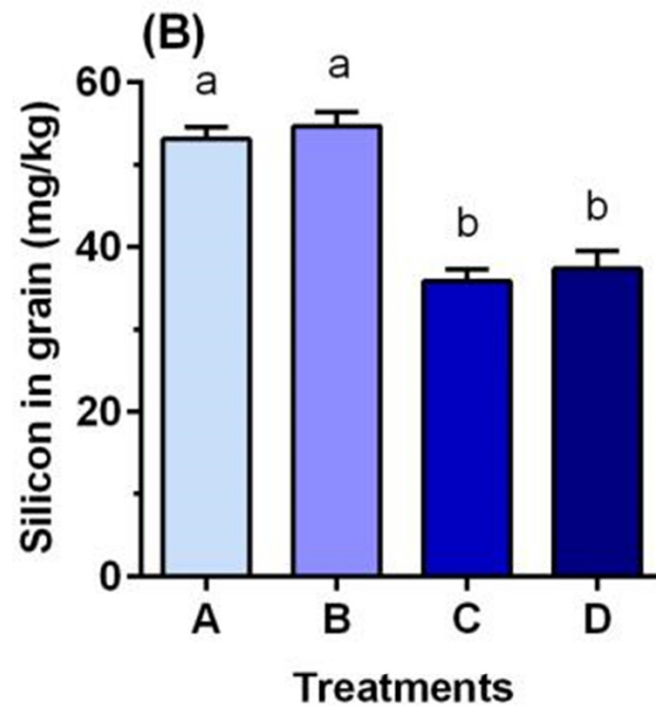
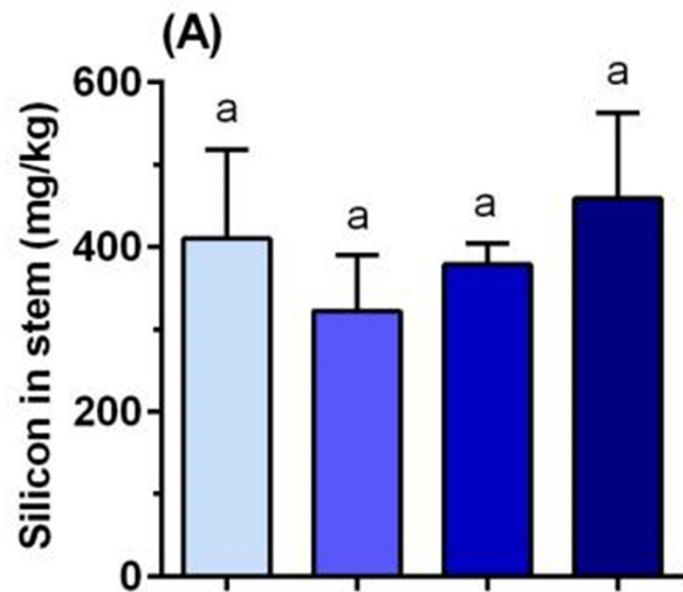




RESULTS

No difference in yield, no. of productive tillers & harvest index

BUT based on production cost, GML is superior



RESULTS

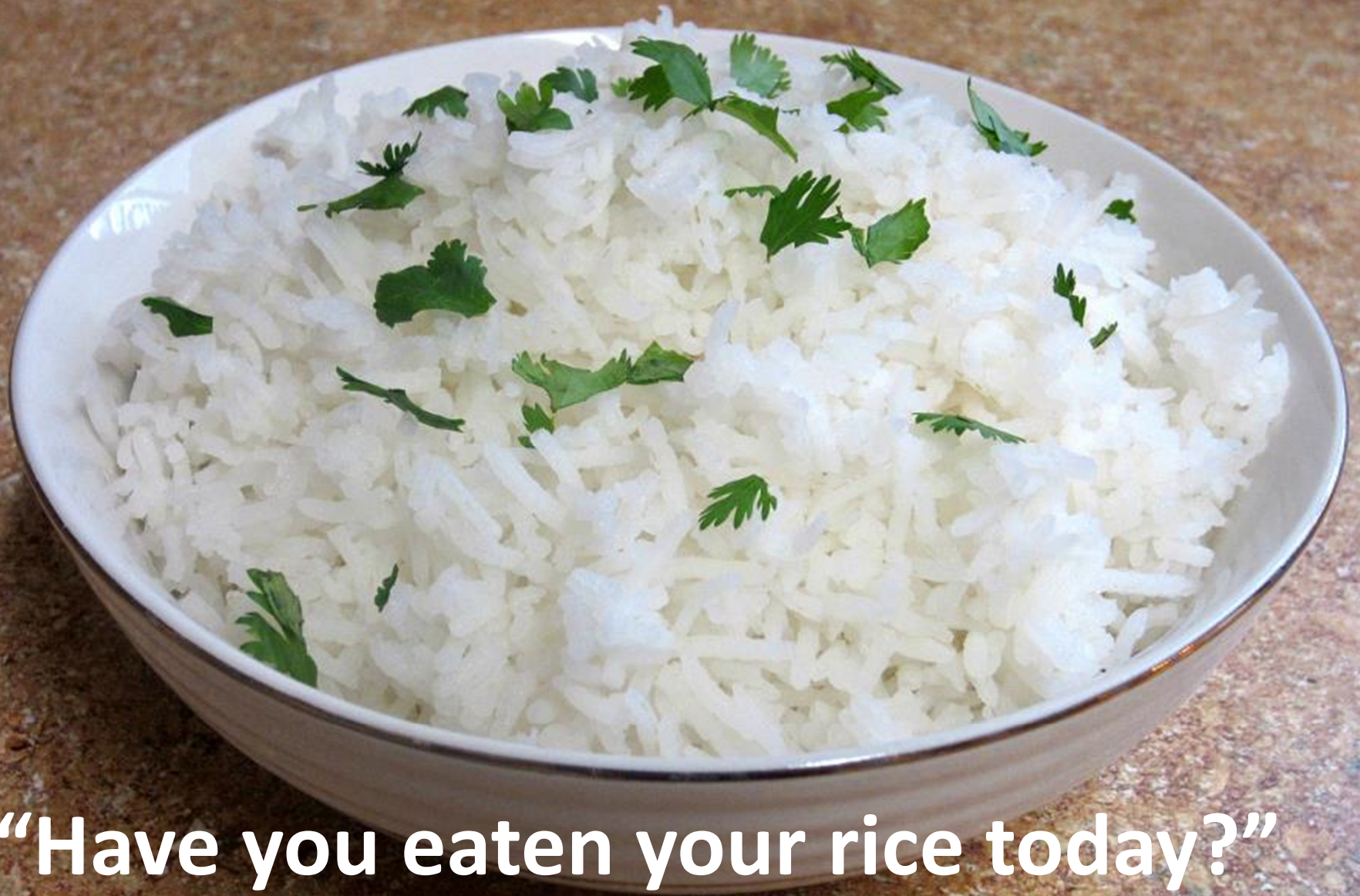
Too much CaSi can reduce Si and Ca accumulation in the grain

Si values in straw and grain, and Ca value in grain are consider low.

Implications of this work

- There is no such thing as “one size fits all”
 - Some varieties may not be responsive to certain fertilisers
- “Grain nutritional quality = yield” : *do you prefer a plate-full of low quality rice or a quarter-full plate with rice pack with nutrition.*
- Many factors affect grain yield and nutritional quality – soil, fertilisers, management practices
- Some rice varieties may be intrinsically have low ability to accumulate certain nutrients
- *Screening for Si transporter in rice* – future work

Thank you for your attention



“Have you eaten your rice today?”