IPNI Southeast Asia Program

Fertilizer recommendation method to support sustainable cassava intensification

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The importance of cassava

"The capacity of cassava to adapt to soils of marginal fertility and uncertain rainfall, as well as its capacity to provide income and thereby alleviate poverty, are the principal attributes that allow this crop to play a catalytic role for rural development ..."

Mahmud Duwayri
FAO, 2001

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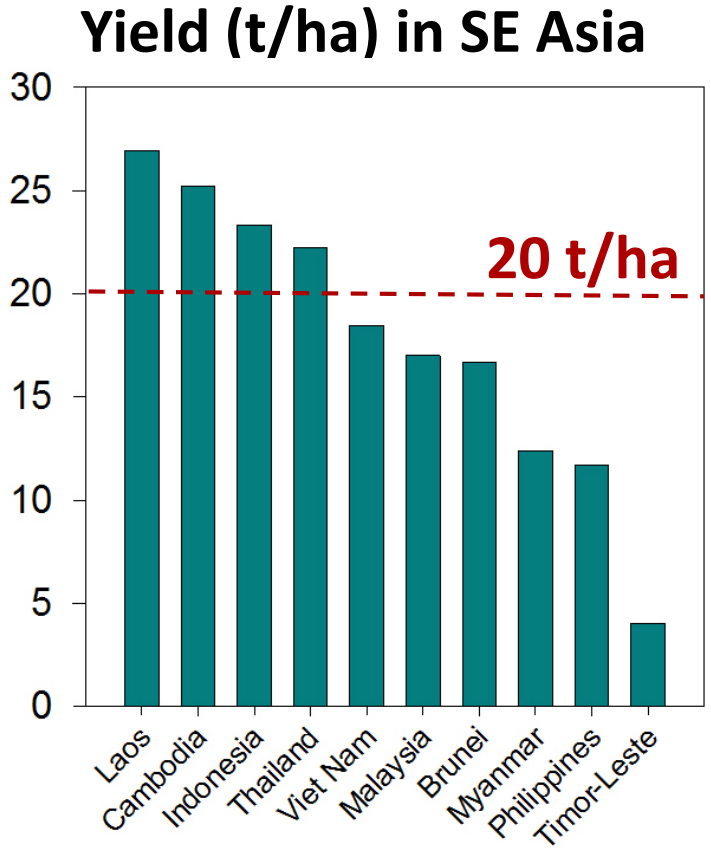
Cassava production (2014)

Region	Area (M ha)	Production (M ton)	Yield (t/ha)
World	24	268	11.2
Africa	17	146	8.4
America	2.4	32	13.3
Asia	4.1	90	21.9



Data source: FAOSTAT, 2017

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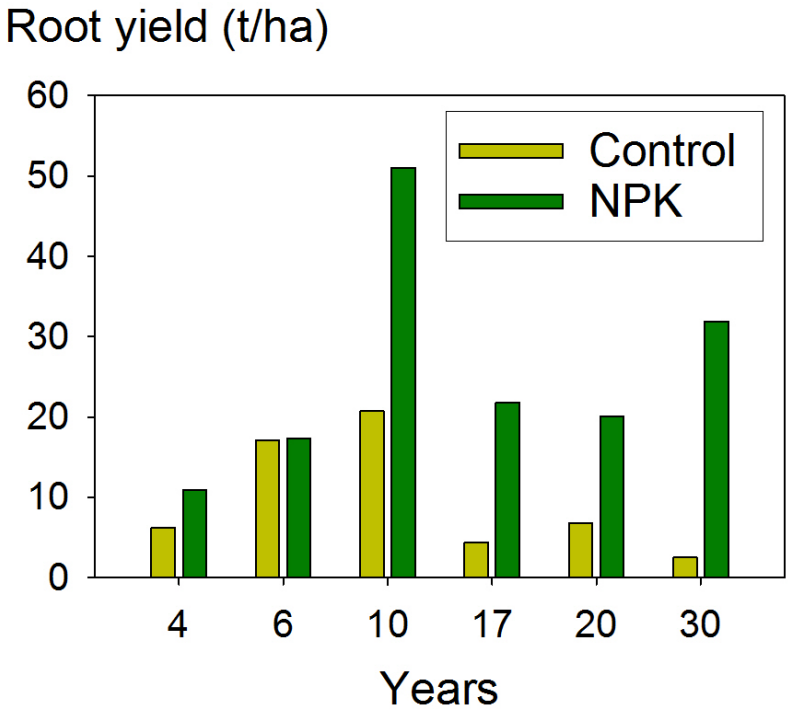
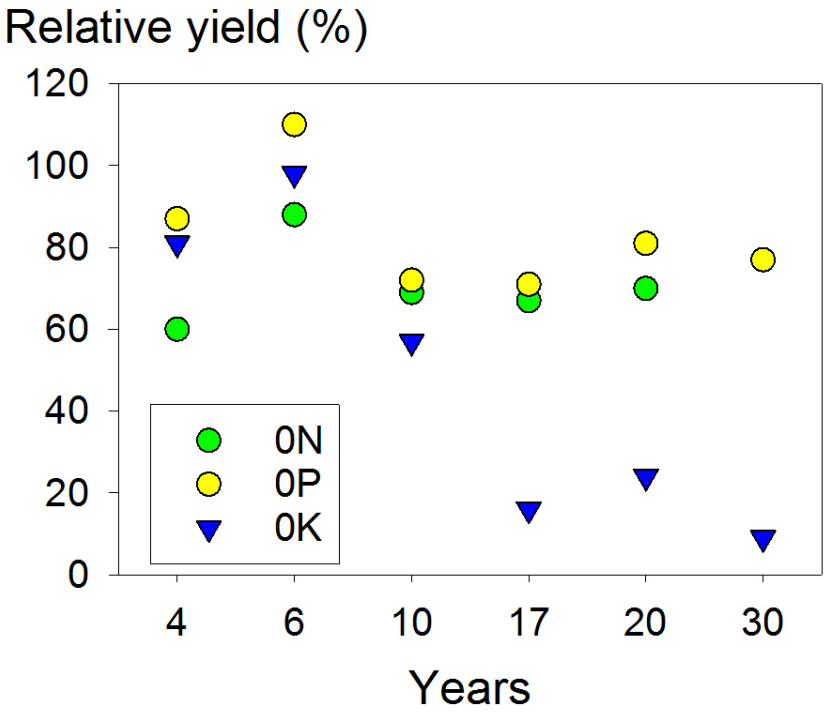
Cassava response to fertilizer

Long-term fertility trials, SE Asia





Adapted from: Howeler, 2014

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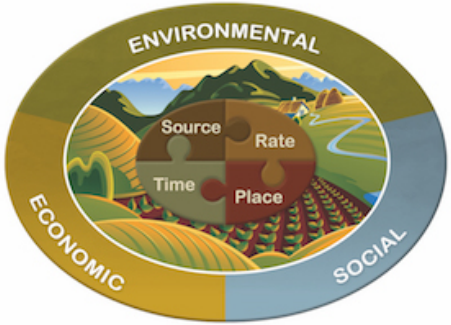
4R Nutrient Stewardship

Applying the right source of plant nutrients at the right rate, at the right time, and in the right place



– can support sustainable cassava intensification

Study Objective

To collect agronomic parameters required in developing a fertilizer recommendation method based on the principles of 4R.

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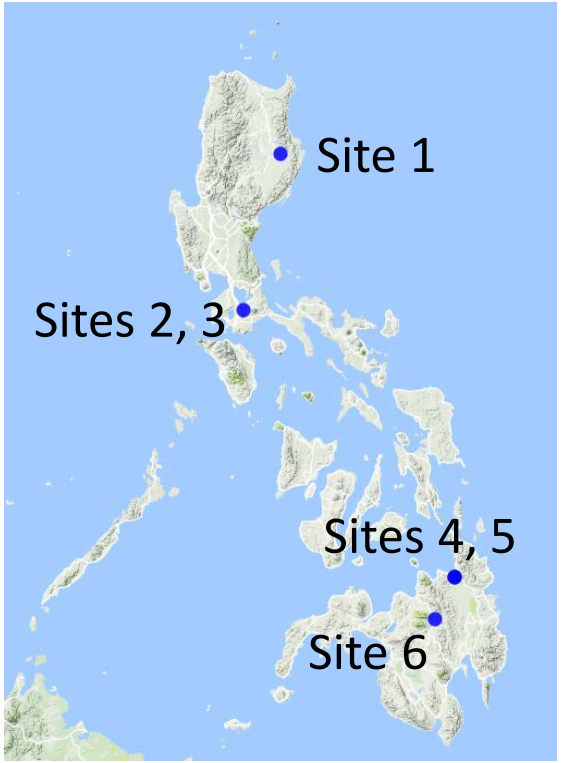
Site characteristics

Philippines: 2014-2016

Site	Texture	pH (1:1 H_2O)	SOM (%)	Avail. P (mg/kg)	Exch. K (cmol/kg)
1	Si CL	5.5	2.0	8	0.4
2	CL	5.7	2.9	23	2.5
3	CL	5.9	3.2	23	4.1
4	CL	5.5	1.9	6	0.3
5	CL	5.4	2.3	5	0.4
6	C	4.9	5.4	7	0.2

Si CL: silty clay loam; CL: clay loam; C: clay



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Experiment design and treatments

Design: Split plot

Main plot (2-3): Variety

Subplot (7): Fertilizer rate

Replication: 3-4

Treatment	Fertilizer rate (N-P_2O_5-K_2O) kg/ha
1) Full NPK	200 – 100 – 350
2) 0N (PK)	0 – 100 – 350
3) 0P (NK)	200 – 0 – 350
4) 0K (NP)	200 – 100 – 0
5) 4R*	180 – 70 – 250
6) NFR	56 – 56 – 56
7) Control	0 – 0 – 0

* Rate in the 1st year; varied with site in subsequent years based on yield response

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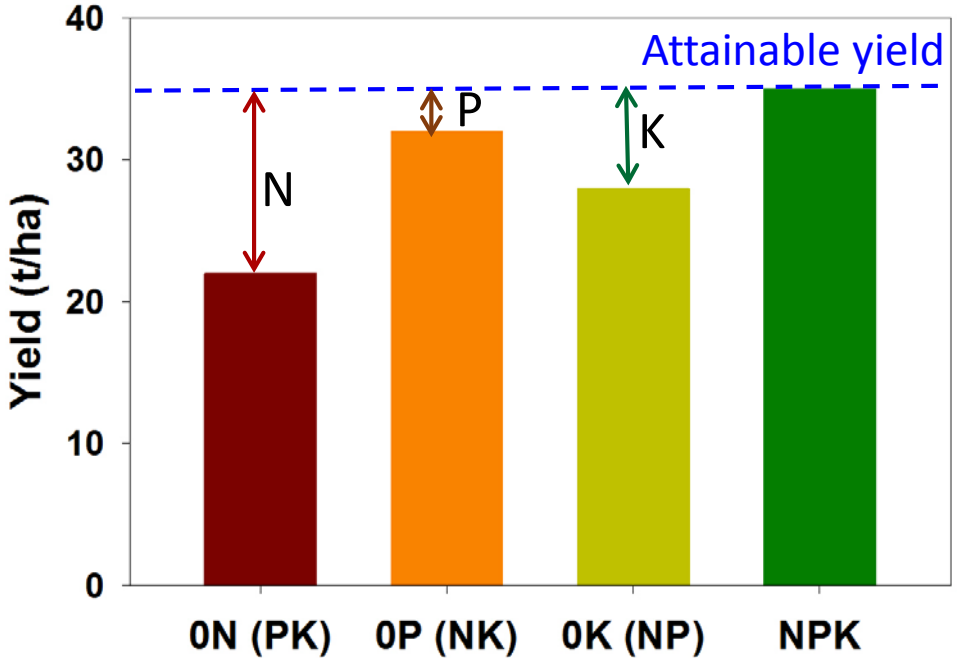
The 4R fertilizer rate

Based on attainable yield and yield response to fertilizer nutrients



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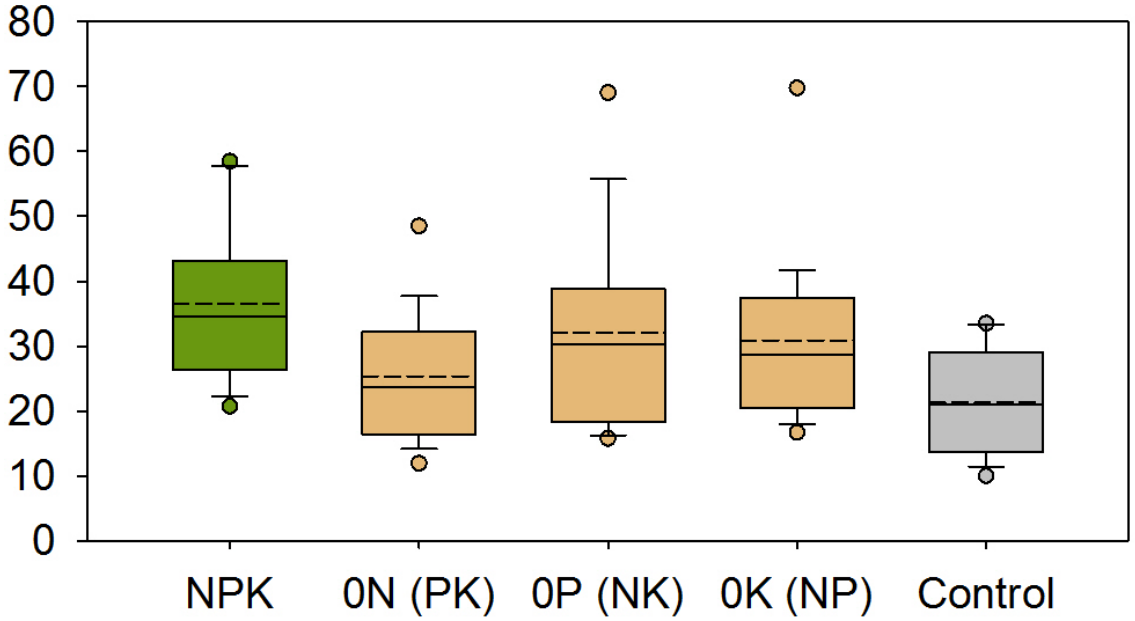
Cassava attainable yield and yield response to fertilizer

Fresh root yield (t/ha)



Varieties = 10

Sites = 6

n = 19

Attainable yield:

20-58 t/ha

Yield response:

N > K > P

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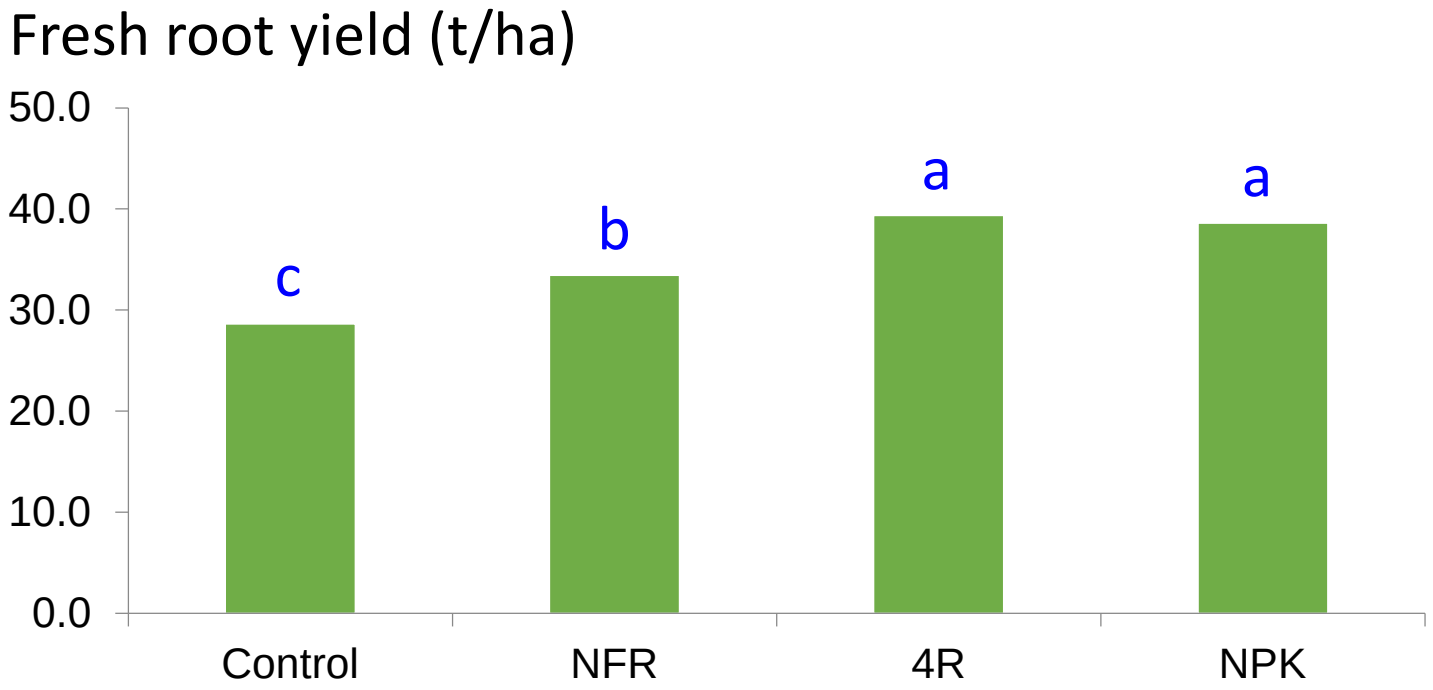
Effect of fertilizer treatment on root yield

Site 1: 2015, 3 varieties



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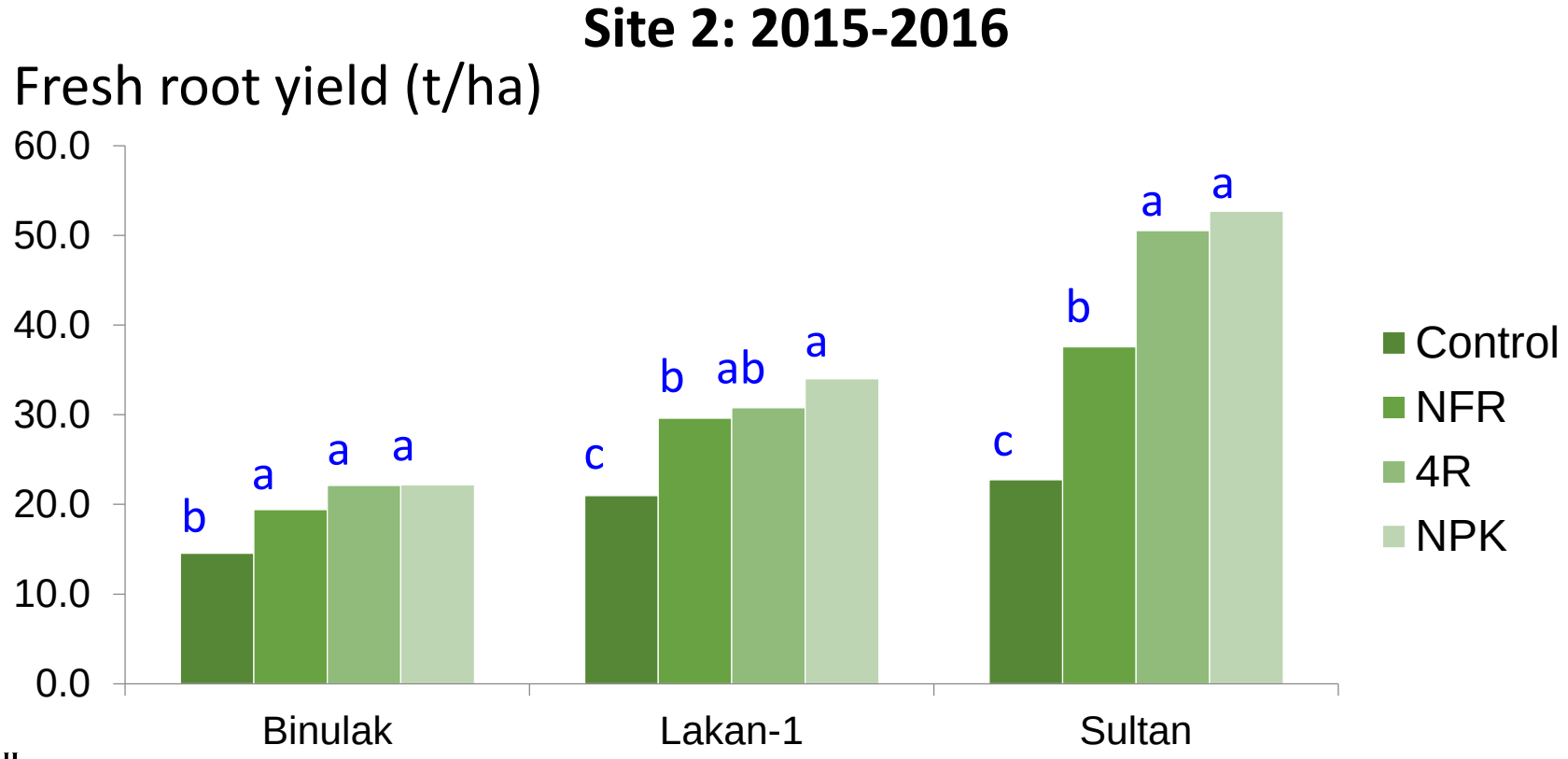
Effect of fertilizer treatment on root yield



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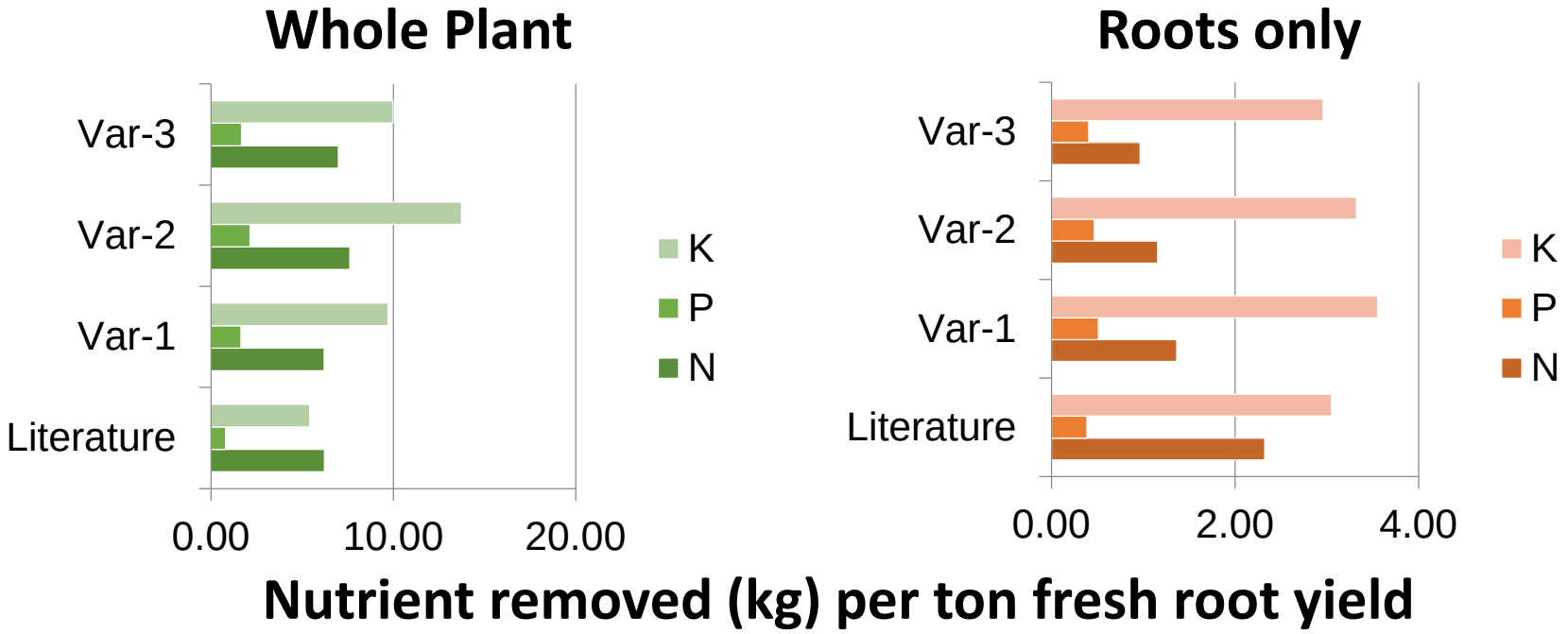
Nutrient removal – whole plant vs. roots



WP: 7 N, 2 P, 11 K (kg/ton)

R: 1.2 N, 0.5 P, 3.2 K (kg/ton)

Literature value: Howeler, 2014

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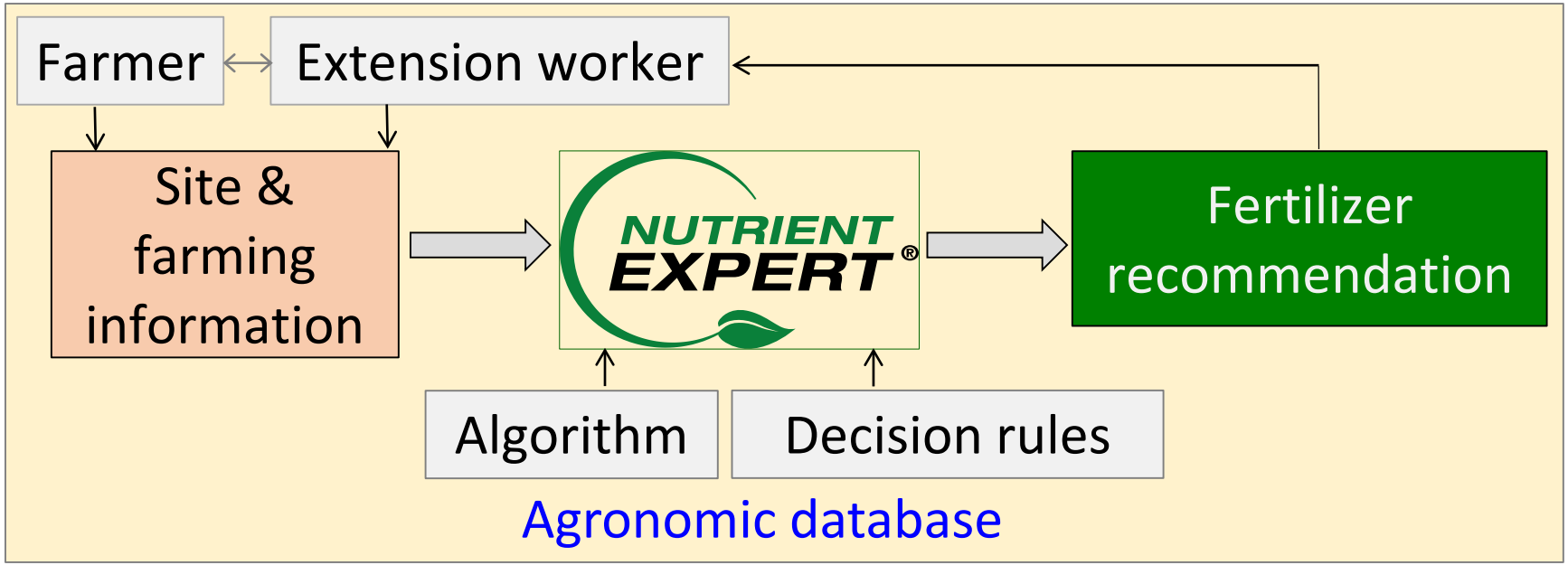
Summary

- Cassava attainable yields and yield response to N, P, and K application vary across locations and varieties.
- Cassava requires large amount of nutrients to produce high yields.
- A fertilizer recommendation method based on 4R principles will help farmers improve their yields and sustain productivity of their fields.

Future outlook

Nutrient Expert® for Cassava will provide 4R-based fertilizer recommendations tailored to individual fields



Pampolino et al., 2012. Comput. Electron. Agric. 88:103-110

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