

PERFORMANCE OF POLY4 BLENDS COMPARED TO MOP BLENDS FOR RICE IN DIFFERENT AGRO-ECOLOGICAL ZONES OF TANZANIA

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Trial locations



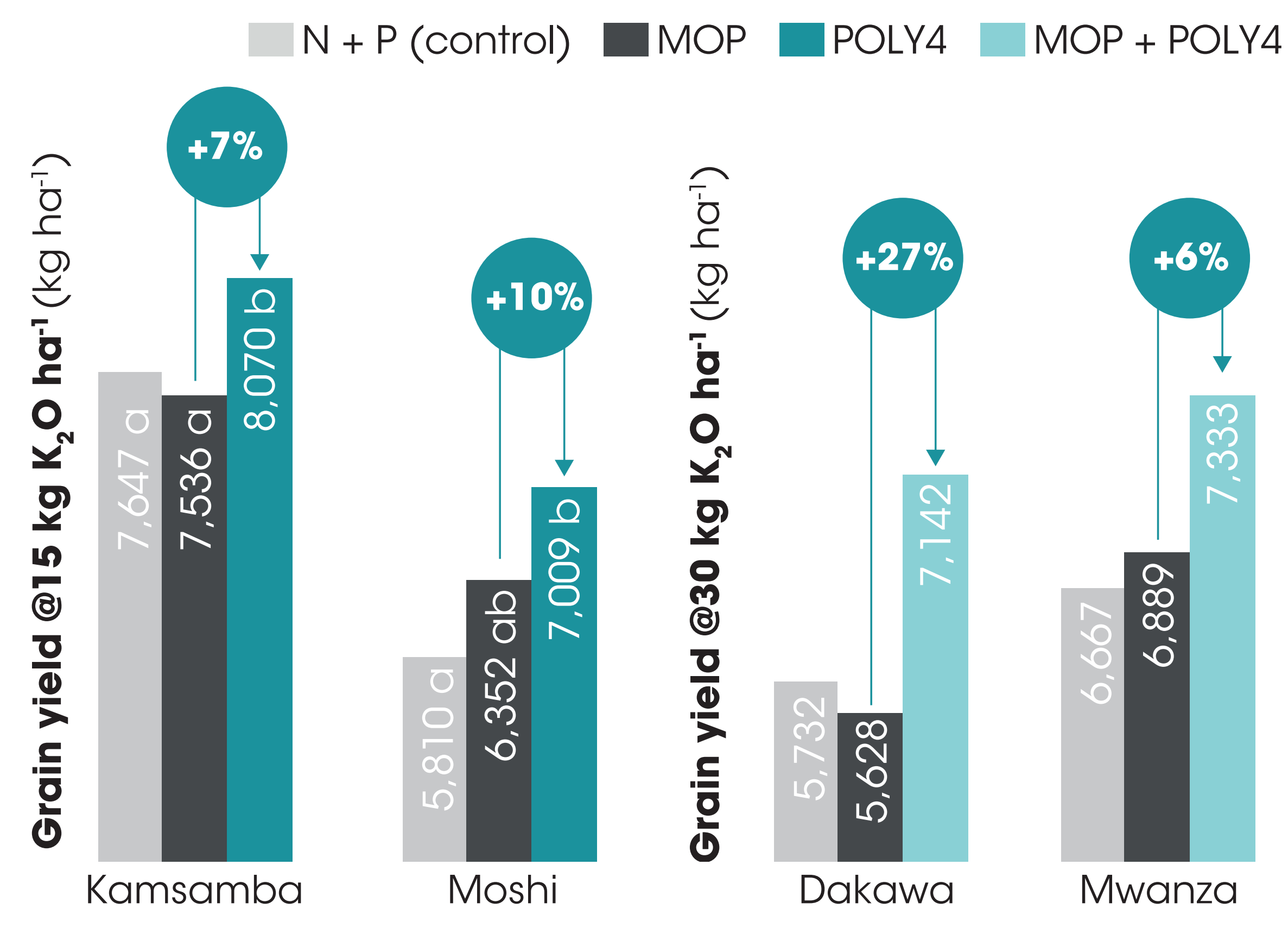
Overview and trial design

- Tanzania was the third largest rice producer in Africa producing 1.2 million hectares per year in 2016.¹
- Tanzanian exchangeable soil K is widely variable² ranging from <8 to >800 mg kg⁻¹. Sites were chosen to represent this range.³
- Local rice farmers apply limited amounts of fertilizers with N being the most commonly applied.
- K fertilizers are not generally used in Tanzania for rice and local advice suggested K does not increase yields.
- Each trial was a randomised block design with four replicates.

Treatments	Nutrients applied (kg ha ⁻¹)					
	N	P ₂ O ₅	K ₂ O	S	CaO	MgO
N + P (control)	120	60	0	0	0	0
POLY4	120	60	15	20	18	6
MOP + POLY4	120	60	30	18	16	6
MOP + POLY4	120	60	45	12	11	4
MOP	120	60	15	0	0	0
MOP	120	60	30	0	0	0
MOP	120	60	45	0	0	0

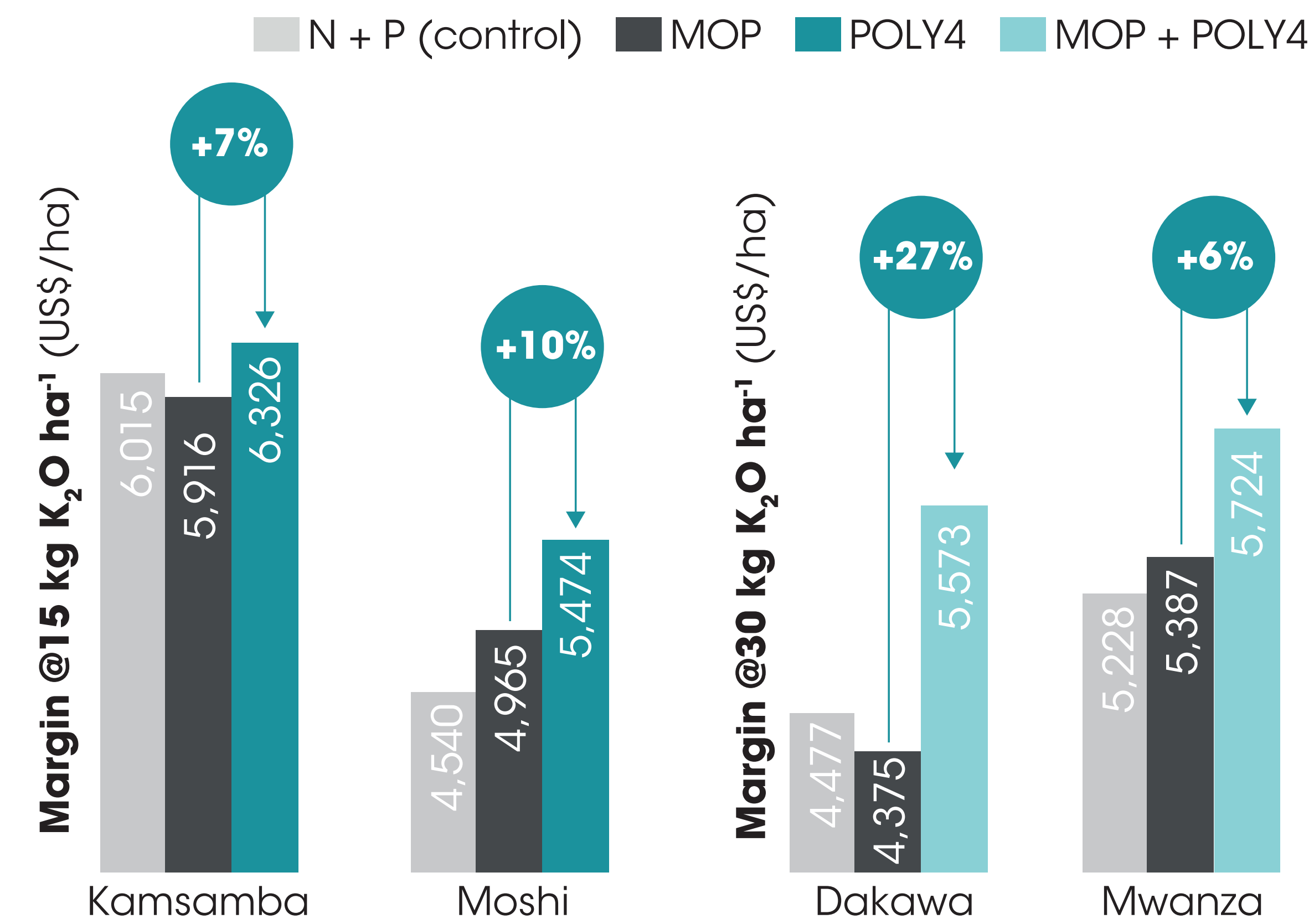
Grain yield⁴

- Grain yield is presented for the K₂O application that achieved maximum yield.
- The rice at Dakawa and Mwanza responded to more K fertilizer and had less available soil K than other sites.
- At two of the four sites MOP-K had lower yield than the N + P (control), and across all sites only increased yield by 137 kg ha⁻¹ on average.
- Including POLY4 in the fertilizer plans produced the largest yield at all four sites.
- At two sites (Kamsamba and Moshi), the POLY4-fertilized yield was significantly greater than the N + P (control). On average yield was 925 kg ha⁻¹ greater (+14%).
- On average POLY4 treatments increased yield by 8% compared to MOP-K treatments.
- At maximum yield, POLY4 increased yield by 787 kg ha⁻¹ (+12%) compared to MOP.



Economic benefit

- Only fertilizer costs (purchase and spreading) and sale price of rice are included.^{5,6}
- Adding MOP to the N + P (control) increased financial returns at two of the four sites. On average, MOP increased fertilizer margins by US\$95/ha.
- Inclusion of POLY4 in the fertilizer plan increased financial margins at all sites. On average, fertilizer margin was increased by US\$614/ha compared to MOP, and US\$709/ha compared to the N + P (control).



Economic cost and benefit of fertilizers⁵

Was it worth changing standard fertilizer practice?

- POLY4 increased fertilizer margins at all sites.
- Farmer returns were US\$21 for every extra US\$ spent on POLY4 compared to the standard N + P programme. This is the benefit:cost ratio.

POLY4 and N + P (control)		Kamsamba 15 kg K ₂ O ha ⁻¹	Dakawa 30 kg K ₂ O ha ⁻¹	Mwanza 30 kg K ₂ O ha ⁻¹	Moshi 15 kg K ₂ O ha ⁻¹	Average
Cost (US\$/ha)	POLY4	155	164	164	155	160
	N + P	126	126	126	126	126
Difference		29	38	38	29	34
Margin (US\$/ha)	Difference	311	1094	497	934	709
	Benefit:cost ratio	11	29	13	32	21

Was it best to add MOP or POLY4?

- Yield increase and consequent margin was inconsistent after MOP was added.
- Farmer returns were US\$32 for every extra US\$ spent on POLY4 compared to the N + P and MOP-K programmes.

POLY4 and MOP		Kamsamba 15 kg K ₂ O ha ⁻¹	Dakawa 30 kg K ₂ O ha ⁻¹	Mwanza 30 kg K ₂ O ha ⁻¹	Moshi 15 kg K ₂ O ha ⁻¹	Average
Cost (US\$/ha)	POLY4	155	164	164	155	160
	MOP	135	145	145	135	140
Difference		19	19	19	19	19
Margin (US\$/ha)	Difference	409	1,196	337	508	613
	Benefit:cost ratio	21	61	17	26	32

Good fertilizer practice

Yield:

- Adding MOP-K to standard N + P fertilizer increased yield, but this was inconsistent.
- Rice yield was increased at all four sites when POLY4 was added to standard N + P programme.
- POLY4 added Mg, Ca and S to supplement crop nutrition and boost crop yield when required
- Modest applications of POLY4 (15 and 30 kg K₂O ha⁻¹) can be recommended for rice growers in Tanzania.
- Fertilizer recommendations should follow soil analysis and good local agronomic advice

Financial return:

- Addition of POLY4 to standard practice (N + P fertilizer only) increased margins at all four sites.
- Addition of POLY4 increased margins at all four sites compared to MOP-K.
- Adding POLY4 to the fertilizer programme was financially very efficient for Tanzanian rice farmers.

Notes: 1) FAOSTAT (2016); 2) Meliyo et al (2015) Variability of exchangeable potassium in soils of Tanzania: A soil fertility challenge for sustainable crop production; 3) All plots, except control, received 120 kg N ha⁻¹ from urea in two application times. Initial soil analysis: Dakawa, pH 6.0, 8 mg P kg⁻¹, 417 mg K kg⁻¹, 9 mg S kg⁻¹; Kamsamba, pH 6.8, 6 mg P kg⁻¹, 768 mg K kg⁻¹, 9 mg S kg⁻¹; Moshi, pH 6.5, 13 mg P kg⁻¹, 1022 mg K kg⁻¹, 5 mg S kg⁻¹; Mwanza pH 7.0, 7 mg P kg⁻¹, 534 mg K kg⁻¹, 8 mg S kg⁻¹; 4) Genstat ANOVA means presented; Fisher's least significant difference (LSD) post hoc test was used to separate means when the ANOVA was significant (α = 0.1). Different letters denote treatments were significantly different; 5) Fertilizer cost: urea = US\$303/t; DAP (diammonium phosphate) = US\$473/t; MOP (muriate of potash) = US\$372/t; POLY4 = US\$266/t; fertilizer spreading cost = US\$1.3–1.7/ha; 6) Sale price for rice: US\$803/t.

Source: Tanzania 25000-SOH-25011-16