

Comparing Yield Response and Nutrient Use Efficiency of Urea Deep Placement Technology with Farmer's Practice of Surface Broadcast of Urea on Transplanted Lowland Rice in Myanmar

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Introduction

Surface broadcasting - Farmer's practice of urea application

- ❖ Amount available to plant – one third of applied urea
- ❖ Loss in various ways – two third of applied urea
- ❖ Needs two to three split applications
- ❖ Effectiveness and yield - less



Introduction

UDP technology - Efficient application practice

- ❖ Onetime application at 5-7 days after transplanting (3-4 weeks after direct seeding)
- ❖ Reduced N loss (up to 50%)
- ❖ Improved rice grain yield (15-35%)
- ❖ Less weeding with UDP
- ❖ Less environment impact



Objective

To compare yield and nutrient use efficiency of UDP technology with that of farmer's practice of surface broadcasting urea on rainfed lowland rice in Delta Region, Myanmar

Materials and Methods

- ❖ 14 trials: 3 trials each in 2 wet seasons and 4 trials each in 2 dry seasons
- ❖ Different townships in Yangon, Bago and Ayeyarwaddy regions
- ❖ Randomized complete block design with 4 treatments and 3 replications
 1. Urea deep placement (UDP) (52 kg N/ha in wet swason and 78 kg N/ha in dry season) with P, K and S basal application
 2. Prilled urea broadcast (UB) with the same N rate as UDP with split application and the same P, K and S rates
 3. Control (0 N) + the same basal P, K and S fertilizers as treatment 1 and 2
 4. Farmer's practice fertilizer (FP) for N and basal (see Table)

Locations, varieties and Farmer Practice (FP) details

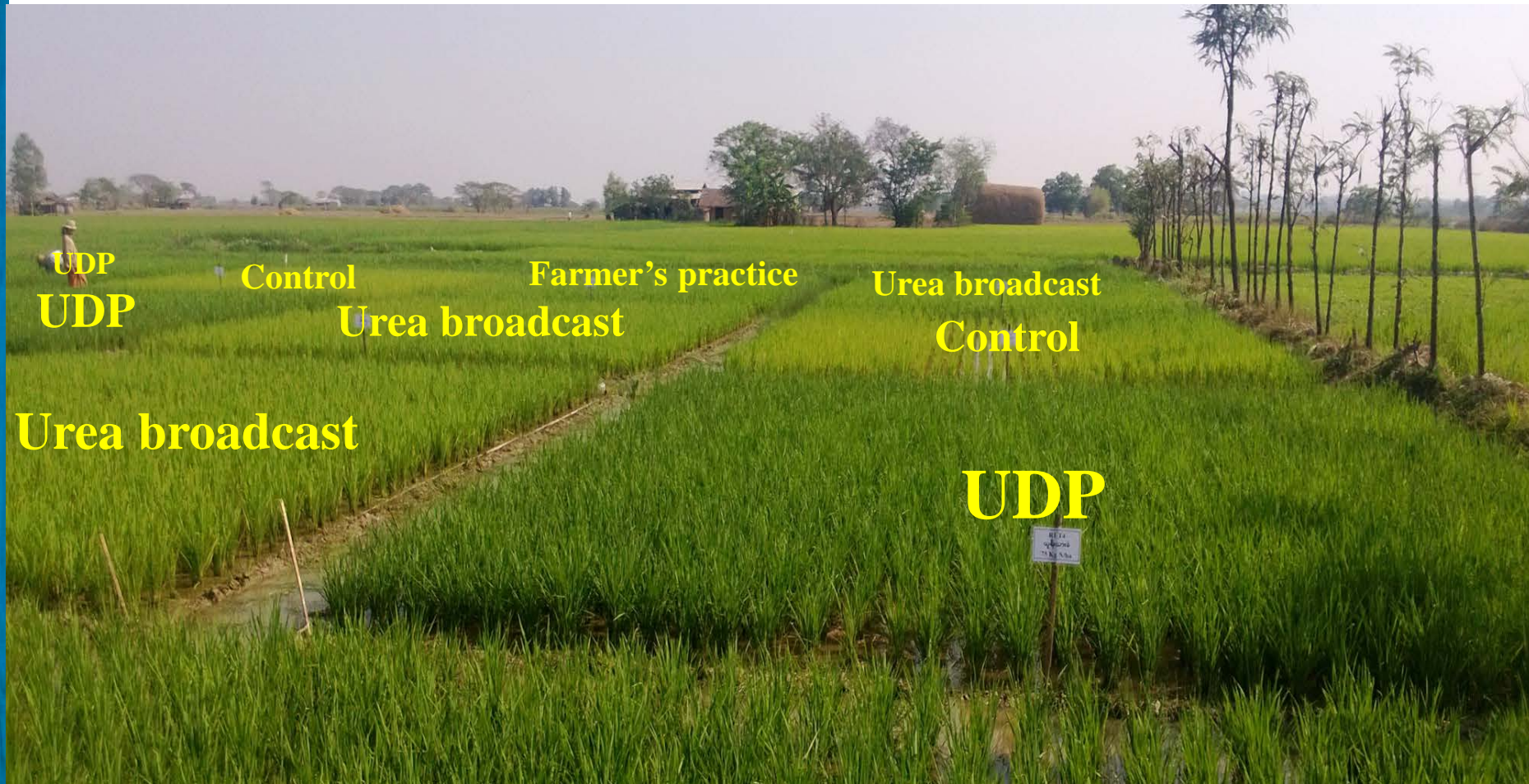
Year/ season	Village	Township	Variety used	N rate with FP (kg/ha)	Basal fertilizer with FP
2014 WS	Sat Ka Lay	Htandabin	Sin Thu Kha	57	No
	Sar Ma Lauk	Nyaungdon	Pale Thwe hybrid	57	No
	Ohn Hnae Gone	Hlegu	Manaw Thu Kha 2	28	No
2015 DS	Ein Lay Lone	Htandabin	Shwe Pyi Htay	57	Compound (15:15:15)
	Nga Pa	Thanlyin	Thee Dat Yin	114	Compound (15:15:15)
	Ohn Hnae Gone	Hlegu	Pale Thwe hybrid	57	Compound (15:15:15)
	U To	Taikkyi	Yadanar Toe	114	Compound (15:15:15)
2015 WS	Too Chaung	Nyaungdon	Sin Thu Kha	57	No
	Wayon Gayet	Maubin	Sin Thu Kha	28	No
	Gyoe Phyu	Taikkyi	GW 1 hybrid	57	No
2016 DS	Ein Gyi	Twantay	Thee Dat Yin	57	TSP only
	Inglone	Kunchangone	Thee Dat Yin	85	TSP + MOP
	Pyin Ma Lwin	Daik-U	Thai Manaw	57	TSP only
	Zay Bine	Thanatpin	Sin Thu Kha	85	TSP + MOP

Materials and Methods

- ❖ Basal blanket fertilizer (except FP) – 36 kg P_2O_5 /ha, 24 kg K_2O /ha and 4.5 kg S/ha (Gypsum 25 kg/ha)
- ❖ ANOVA – A Generalized linear mixed model and LSD at $P_{(0.05)}$
- ❖ Yield improvement of UDP over other treatments (%)
- ❖ Nutrient use efficiency (kg of rice grains from kg of N applied)



Results and Discussion



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Results and Discussion

Significant tests of sources of variation for each year and season

Effect	2014 wet season		2015 dry season		2015 wet season		2016 dry season	
	F value	Pr > F	F value	Pr > F	F value	Pr > F	F value	Pr > F
Treatment	22.19	< .0001	30.92	< .0001	14.90	< .0001	17.58	< .0001
Location	154.5	< .0001	23.14	< .0001	19.67	< .0001	8.34	< .0003
Location*Treatment	3.59	0.011	0.39	0.93	2.97	0.026	0.89	0.54

Comparison of Treatment Means of Each Location for 2104 and 2015 Wet Seasons

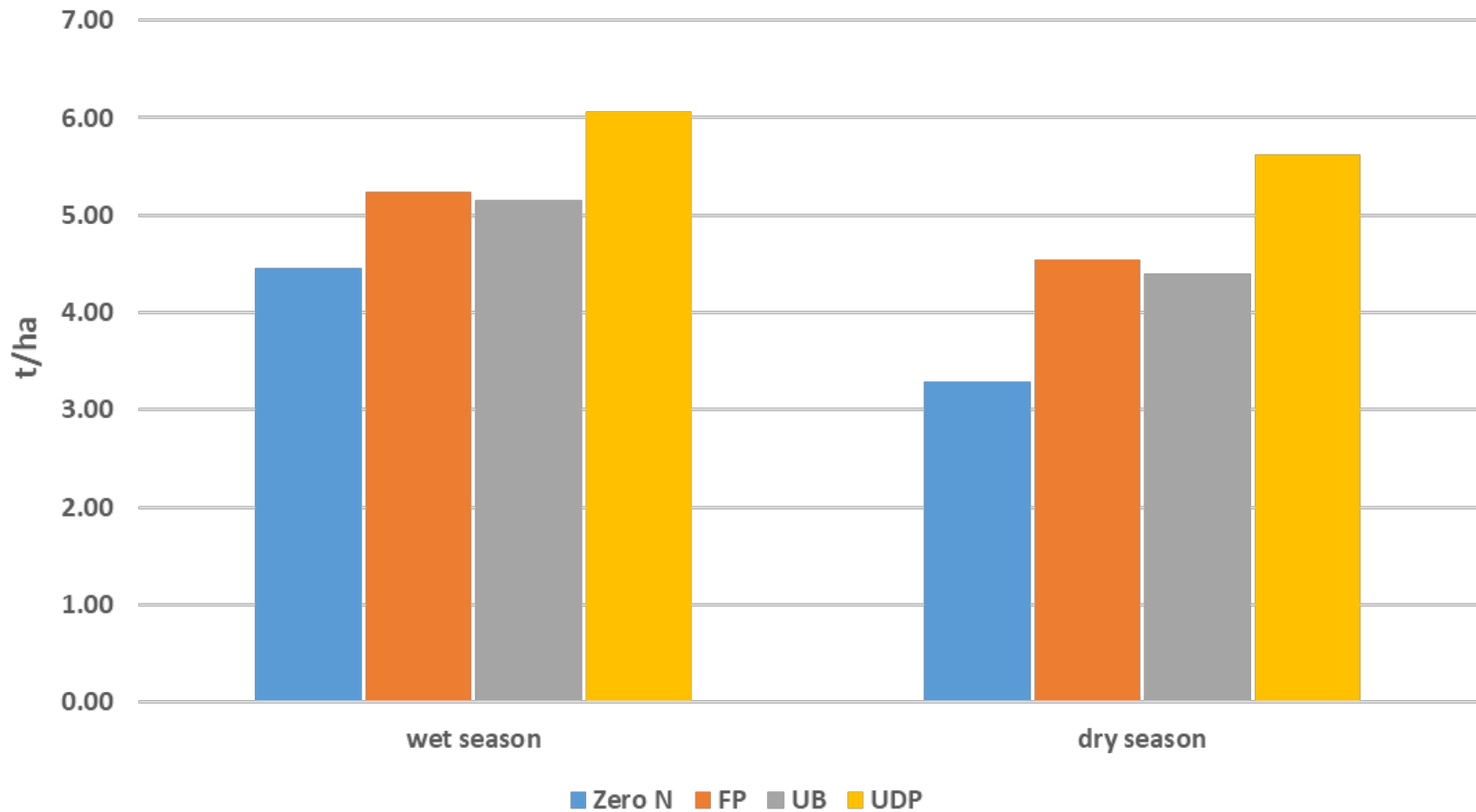
2014 wet season			2015 wet season		
Location	Mean Yield	LSD _(0.05)	Location	Mean Yield	LSD _(0.05)
Treatment	(t/ha)	Comparison	Treatment	(t/ha)	Comparison
Sat Ka Lay			Too Chaung		
Control (0 N)	3.97	c	Control (0 N)	3.13	c
FP (57 kg N)	5.49	b	FP (57 kg N)	4.99	b
UB (52 kg N)	4.87	b	UB (52 kg N)	4.04	c
UDP (52 kg N)	6.38	a	UDP (52 kg N)	5.93	a
Sar Ma Lauk			Wayon Gayet		
Control (0 N)	6.38	ns	Control (0 N)	4.65	c
FP (57 kg N)	6.58	ns	FP (28 kg N)	5.35	bc
UB (52 kg N)	6.28	ns	UB (52 kg N)	5.92	ab
UDP (52 kg N)	6.86	ns	UDP (52 kg N)	6.12	a
Ohn Hnae Gone			Gyoe Phyu		
Control (0 N)	3.06	b	Control (0 N)	5.54	b
FP (28 kg N)	3.55	b	FP (57 kg N)	5.44	b
UB (52 kg N)	3.67	b	UB (52 kg N)	6.13	ab
UDP (52 kg N)	4.59	a	UDP (52 kg N)	6.53	a

Comparison of Mean Yields across Locations and Years for Dry Seasons

Treatment	2015	
	Mean Yield	LSD _(0.05)
	(t/ha)	Comparison
Control (0 N)	3.29	c
FP (95 kg N)	4.85	b
UB (78 kg N)	4.53	b
UDP (78 kg N)	5.93	a

Treatment	2016	
	Mean Yield	LSD _(0.05)
	(t/ha)	Comparison
Control (0 N)	3.30	c
FP (71 kg N)	4.23	b
UB (78 kg N)	4.26	b
UDP (78 kg N)	5.31	a

Mean Yields for Wet and Dry seasons



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Percent Yield Superiority of UDP over other Treatments and NUE of Fertilizer Practices

Treatment	Wet Season				Dry Season			
	N rate (avg)	Yield	% of	NUE	N rate (avg)	Yield	% of	NUE
	(kg/ha)	(t/ha)	UDP over	kg/kg N	(kg/ha)	(t/ha)	UDP over	kg/kg N
Zero N	0	4.46	36	-	0	3.30	70	-
FP	47	5.23	16	16	83	4.54	24	15
UB	52	5.15	18	13	78	4.39	28	14
UDP	52	6.07	-	31	78	5.62	-	30

Conclusions

- ❖ UDP technology gave higher yield than UB with the same N and basal P, K and S rates
- ❖ UDP technology with similar or lower N rates gave higher yield than FP
- ❖ UDP technology is equally effective in both dry and wet seasons – gave similar NUE
- ❖ Nutrient use efficiency of UDP is double
- ❖ Yield improvement was 28% in dry season and 18% in wet season