

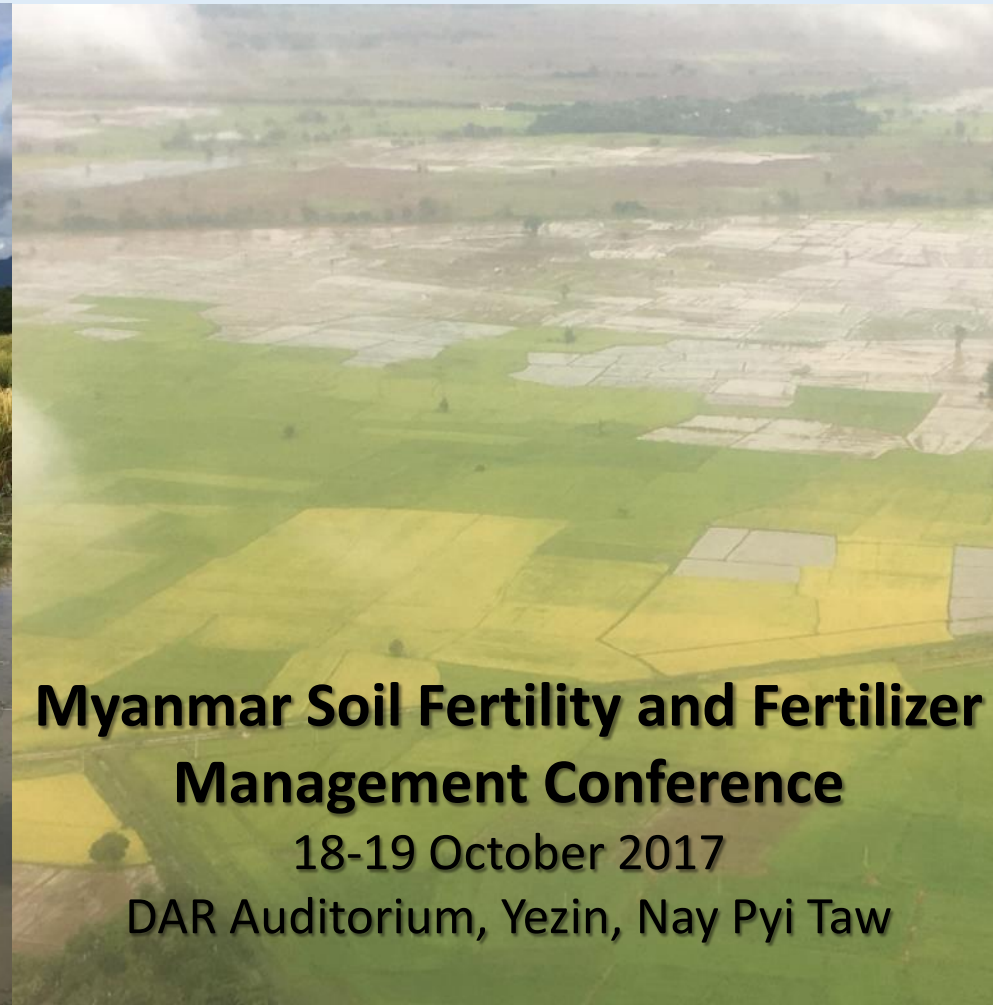
Dry season rice yield response to Nitrogen fertiliser in Central Myanmar

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Australian Government

Australian Centre for
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**Myanmar Soil Fertility and Fertilizer
Management Conference**

18-19 October 2017

DAR Auditorium, Yezin, Nay Pyi Taw



ACIAR Project: SMCN/2014/044

Management of nutrients

for improved profitability and sustainability of crop production in central Myanmar

Project Objectives:

Objective 1 – To establish the biophysical basis for appropriate fertilizer use for rice and maize crops in central Myanmar

Objective 2 – To determine and address economic and policy related constraints to adoption of improved rice and maize production

Objective 3 – To build capacity for the long-term improved nutrient management at the farm level, through training of YAU staff

Objective 4 – To develop decision support systems for Myanmar rice and maize crops and for intensive vegetable production in Victoria, Australia

Background & Objectives

- Rice crop yields in Myanmar considered to be relatively low
- Thought to be due to inadequate applications of fertiliser, especially N

Objective of study

- to determine crop N requirement and optimal N fertiliser rate for dry season rice.
- To inform and validate crop modelling for development of a fertilizer decision support tool for farmers in central Myanmar

Experiment design

Design: 8 treatments × 3 replicates in RCB design;
5m x 5m plots, bunded, central 1.8m x 1.8m harvest area; Irrigated;
2 sites – **Taungoo** (silty light clay) and **YAU** (sandy clay loam to clay loam – sandy).

<u>Treatments</u>	
T ₁ = Nil input control (Nil)	
T ₂ = Zero N – 0 kg N/ha (0N)	Farmer Practice (T₂ to T₇) surface broadcast half to one 50 kg bag urea / acre (28-57 kg N/ha) as two equal split applications at 10 DAT and at Panicle Initiation phase of crop
T ₃ = 30 kg N/ha (30N)	
T ₄ = 77.6 kg N/ha (77.6N)	
T ₅ = 100 kg N/ha (100N)	
T ₆ = 130 kg N/ha (130N)	
T ₇ = 160 kg N/ha (160N)	
T ₈ = IFDC UDP 77.6 kg N/ha (UDP)	

- ❖ Treatments T2 to T8 received basal inputs of PKSZn – 40 kg P/ha; 25 kg S/ha; 75 kg K/ha;
- ❖ Planted in these plots were dipped into a 2% Zn solution (as ZnSO₄).

Urea super granule (USG)

- UDP technology (IFDC)
- Used 2.7 g granule in this study
- Deep placement at 7 – 8 cm below the surface, manually
- 77.6 kg N/ ha



To 7 – 8 cm depth

Rice transplanting



Soil sampling, Basal Fertilizer Application & Transplanting



Timing of 'within crop' soil and plant sampling

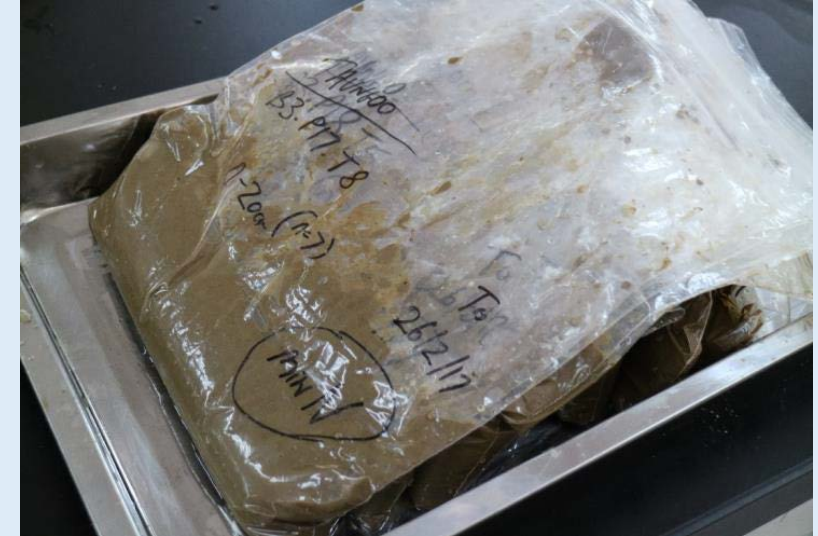
- (i) Active mid-tillering phase (30DAT)
- (ii) Panicle Initiation (60DAT),
- (iii) Flowering
- (iv) Plant Maturity (PM)
- (v) Harvest



^{15}N study to investigate N use efficiency using Microplots



Mineral N Analysis (KCl extraction)





Harvest

All aboveground portion of rice plant

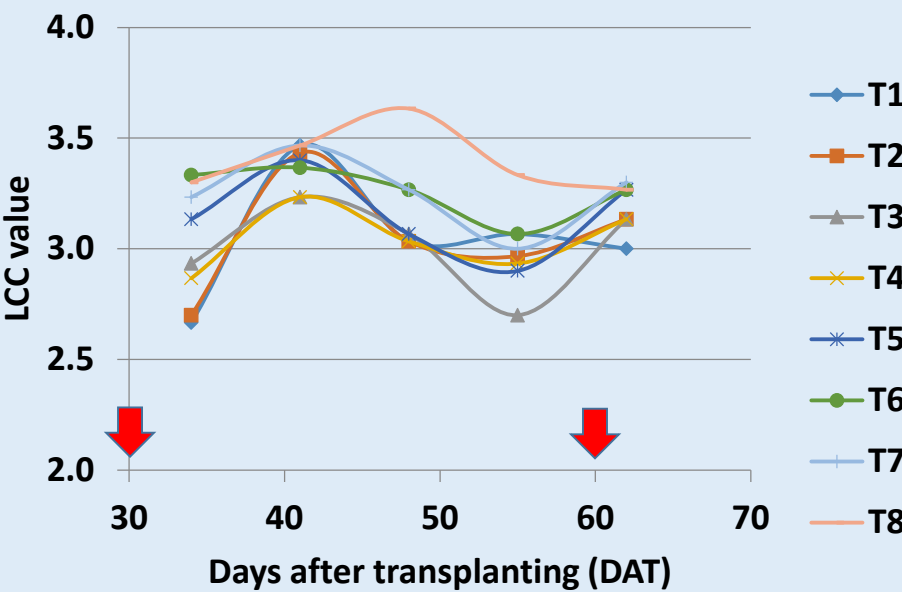
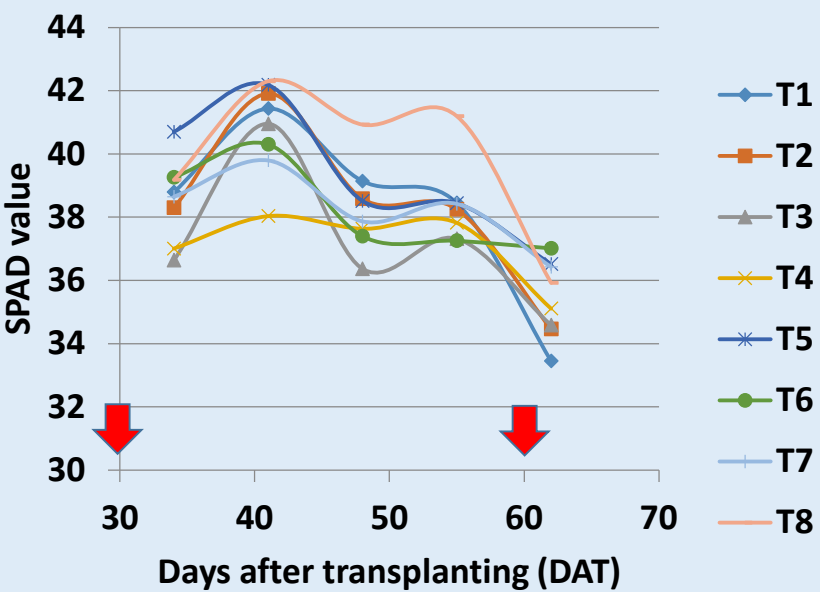
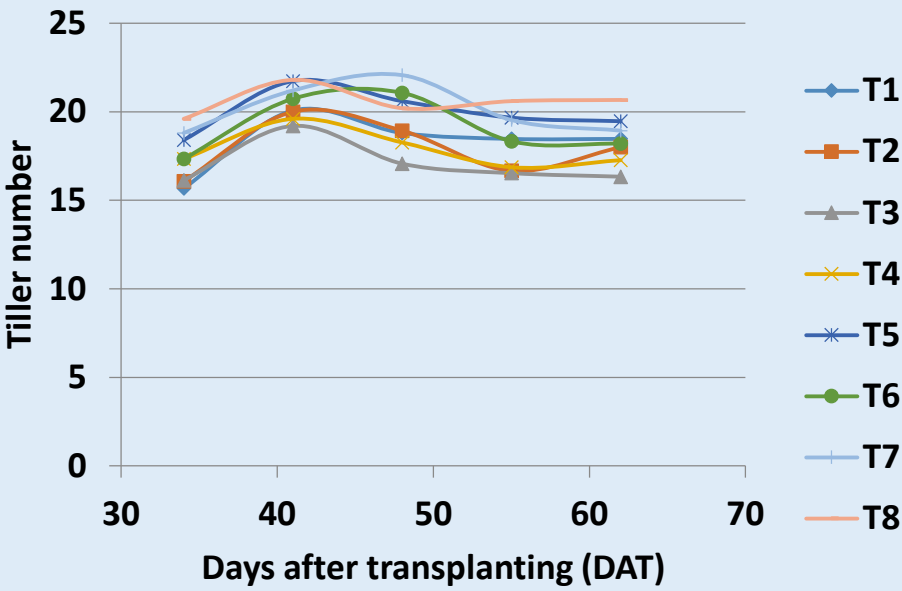
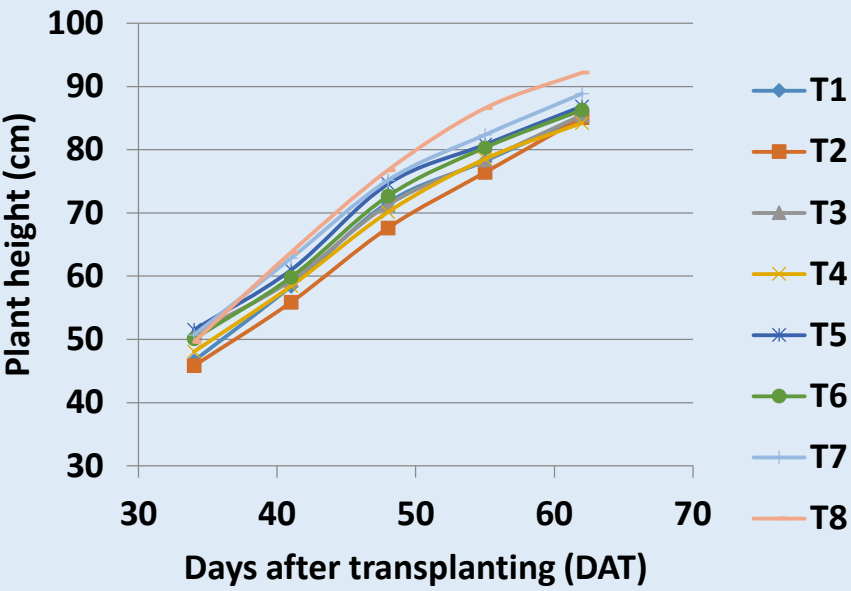


Yield Investigation

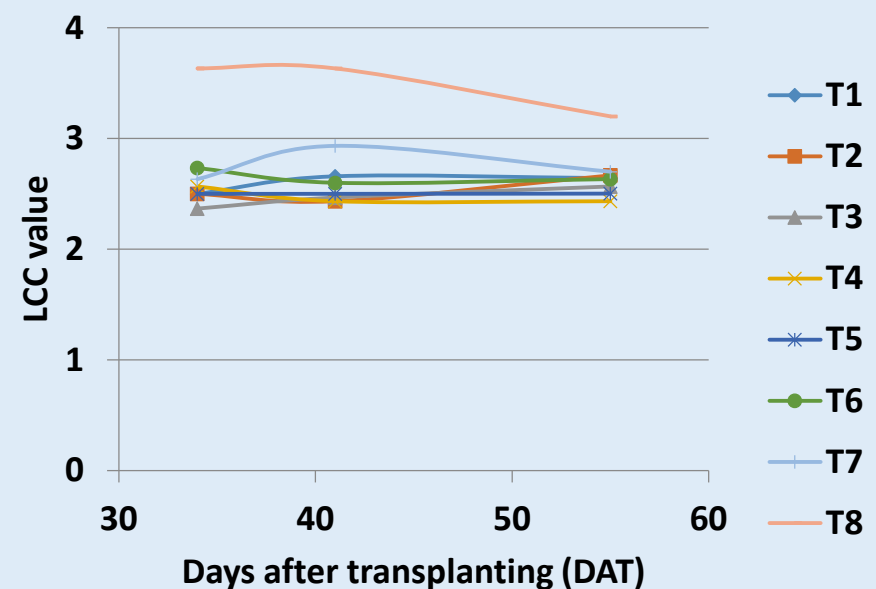
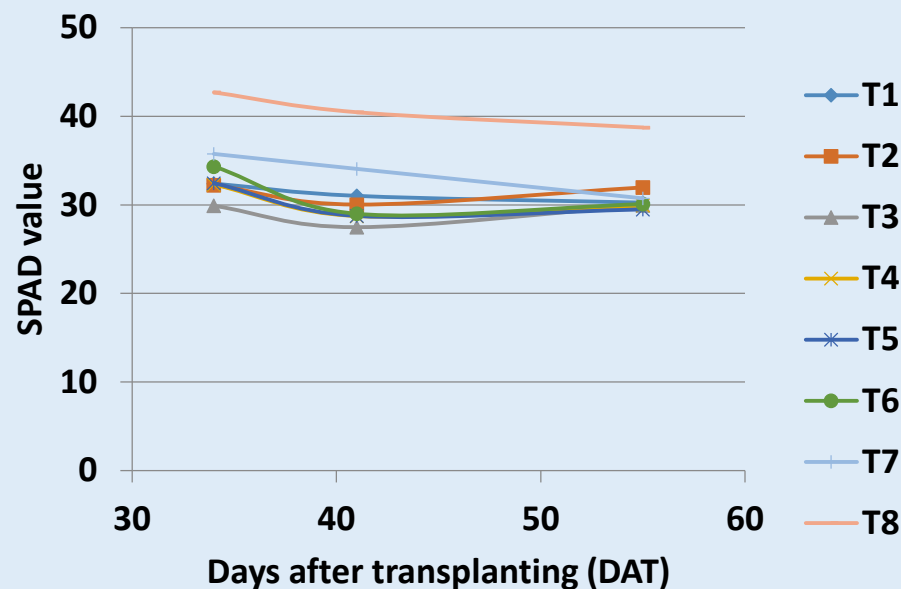
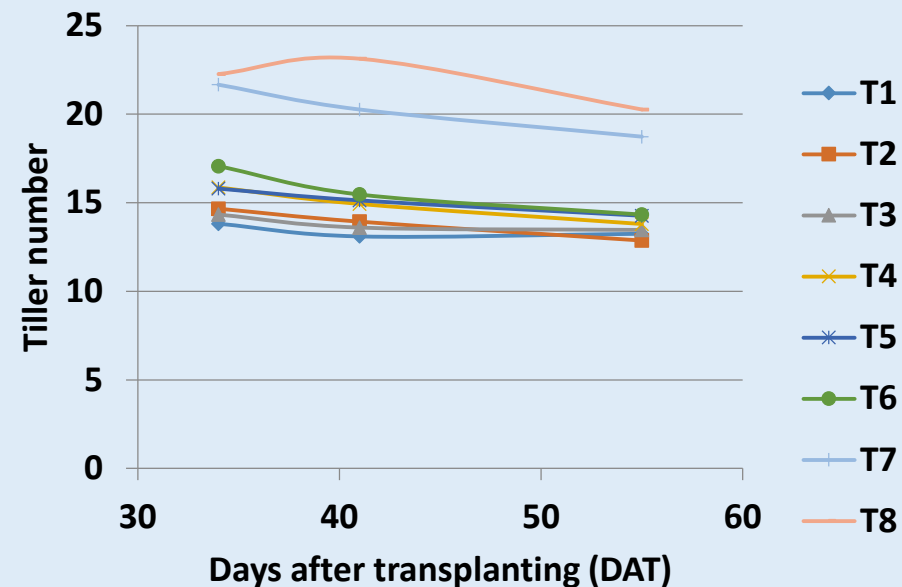
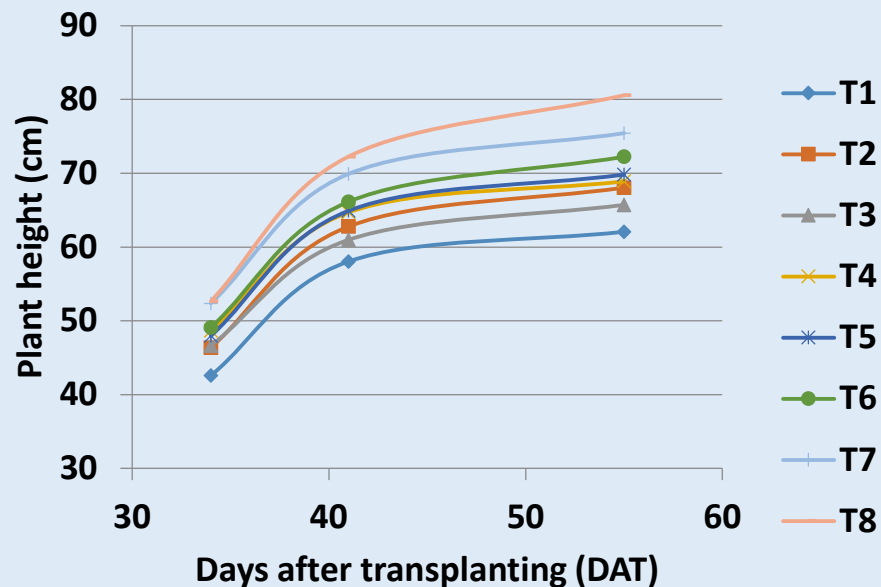


Results

Agronomic characters recorded in YAU rice field



Agronomic characters recorded in Taungoo rice field

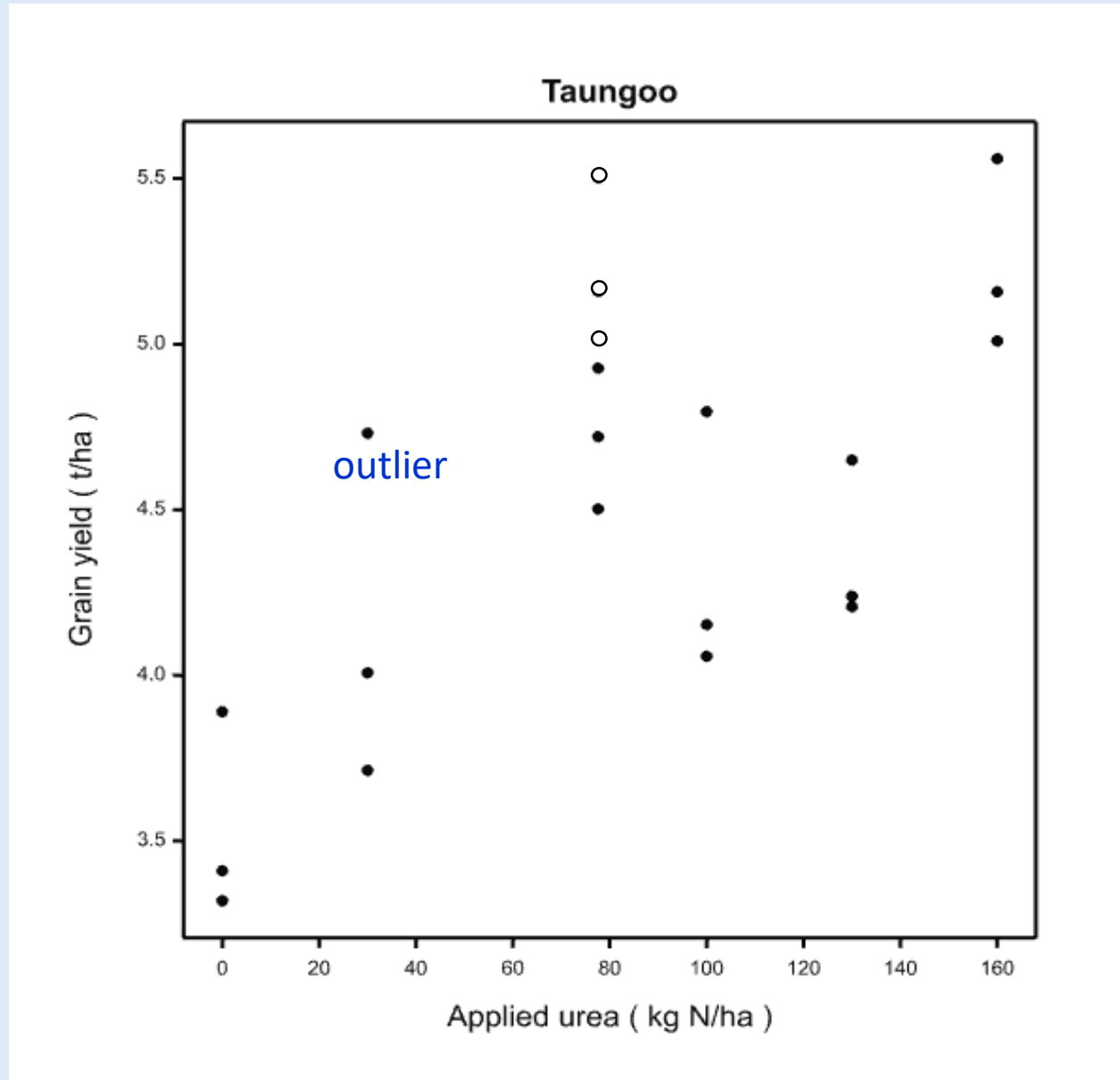


Grain yield and biomass of the dry season rice response to Nitrogen fertiliser in Taungoo

Treatment	Grain yield (t/ha)	Dry biomass (t/ha)
T1 – nil control	3.74 (0.57) c	6.78 (0.82) cd
T2 – 0 kg N/ha	3.54 (0.55) c	5.86 (0.77) d
T3 – 30 kg N/ha	3.86 (0.59) c	6.91 (0.83) cd
T4 – 77.6 kg N/ha	4.72 (0.67) a	7.45 (0.87) bcd
T5 – 100 kg N/ha	4.34 (0.64) b	6.47 (0.81) cd
T6 – 130 kg N/ha	4.37 (0.64) b	8.68 (0.93) abc
T7 – 160 kg N/ha	5.24 (0.72) a	9.95 (1.00) a
T8 – UDP – 77.6 kg N/ha	5.23 (0.72) a	9.38 (0.97)ab
<i>l.s.d (P=0.05)</i>	(0.05)	(0.12)

UDP results for grain yield : Student t-test : T4 vs T8 found P = 0.054, but suboptimal reps only 3.

Grain yield of the dry season rice response to Nitrogen fertiliser in Taungoo

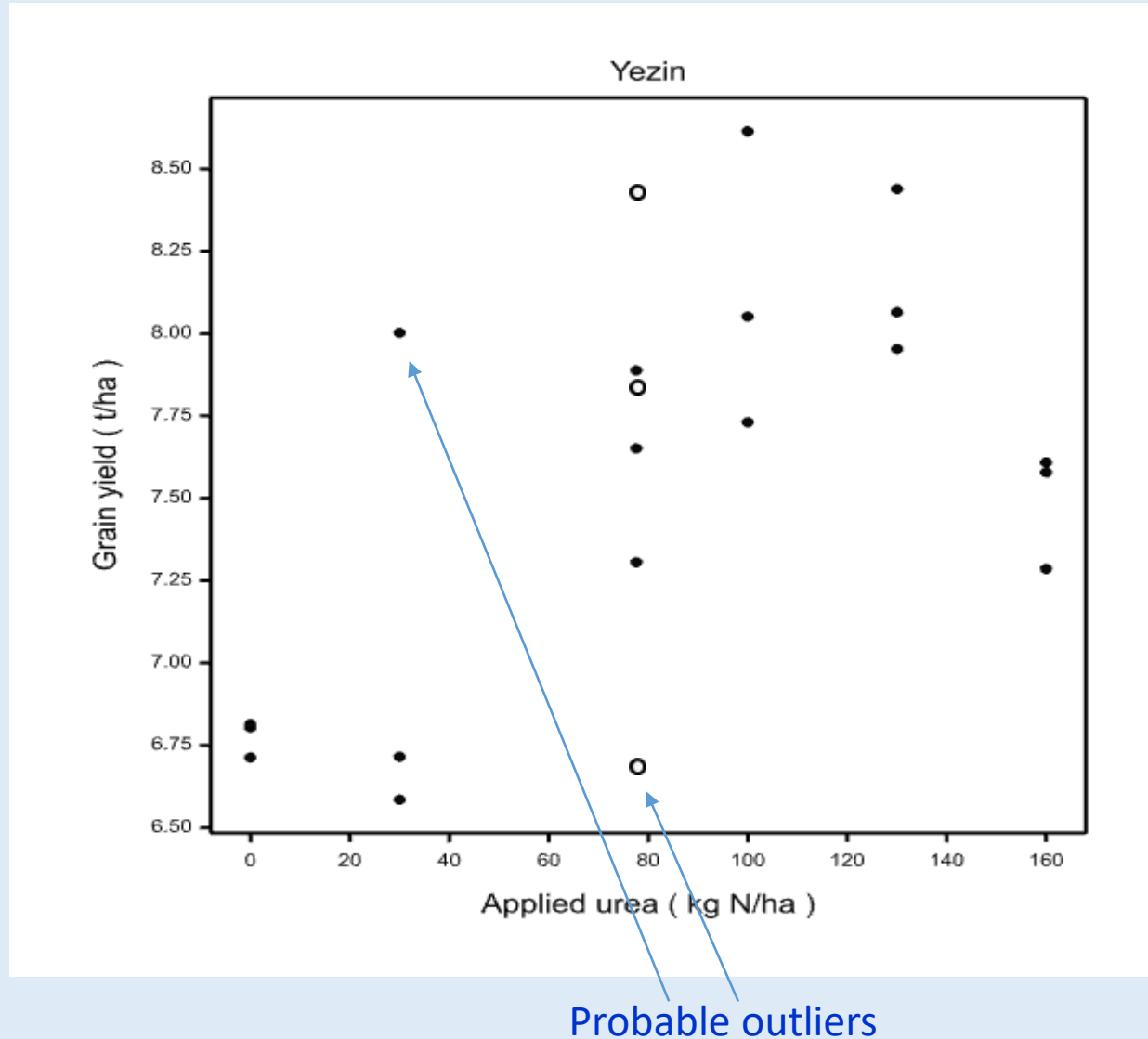


Grain yield and biomass of the dry season rice response to Nitrogen fertiliser in YAU Farm

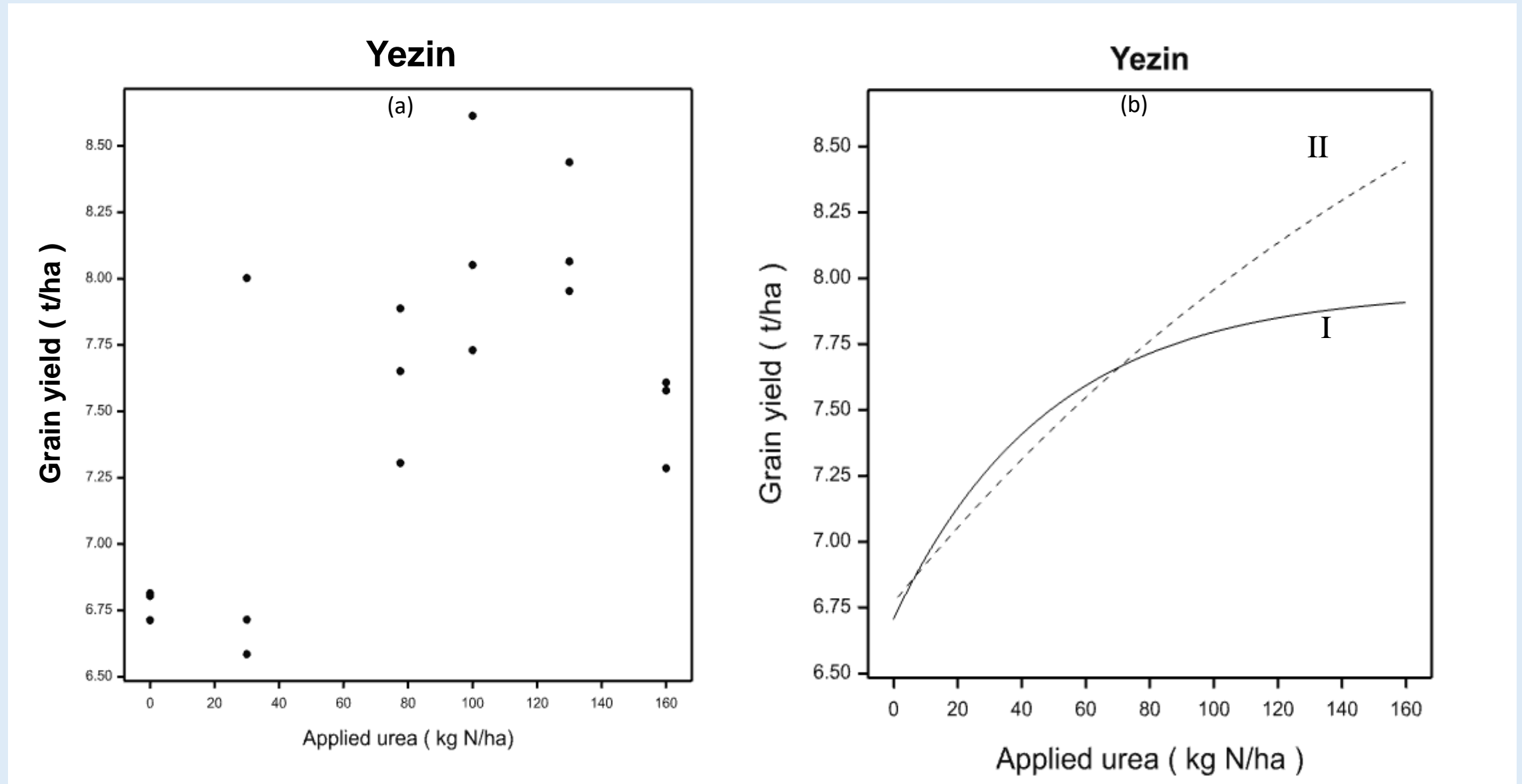
Treatment	Grain yield (t/ha)	Dry biomass (t/ha)
T1 – nil control	6.89bc	11.0c
T2 – 0 kg N/ha	6.78c	13.3b
T3 – 30 kg N/ha	7.10bc	15.2ab
T4 – 77.6 kg N/ha	7.62 ab	15.0ab
T5 – 100 kg N/ha	8.13a	16.8a
T6 – 130 kg N/ha	8.15a	15.3ab
T7 – 160 kg N/haY	7.49abc	15.4ab
T8 – UDP – 77.6 kg N/ha	7.65 ab	17.0a
<i>l.s.d (P=0.05)</i>	0.76	2.2

*** **Note** T7 grain yield for Taungoo was 5.24 t/ha

Grain yield and biomass of the dry season rice response to Nitrogen fertiliser in YAU Farm

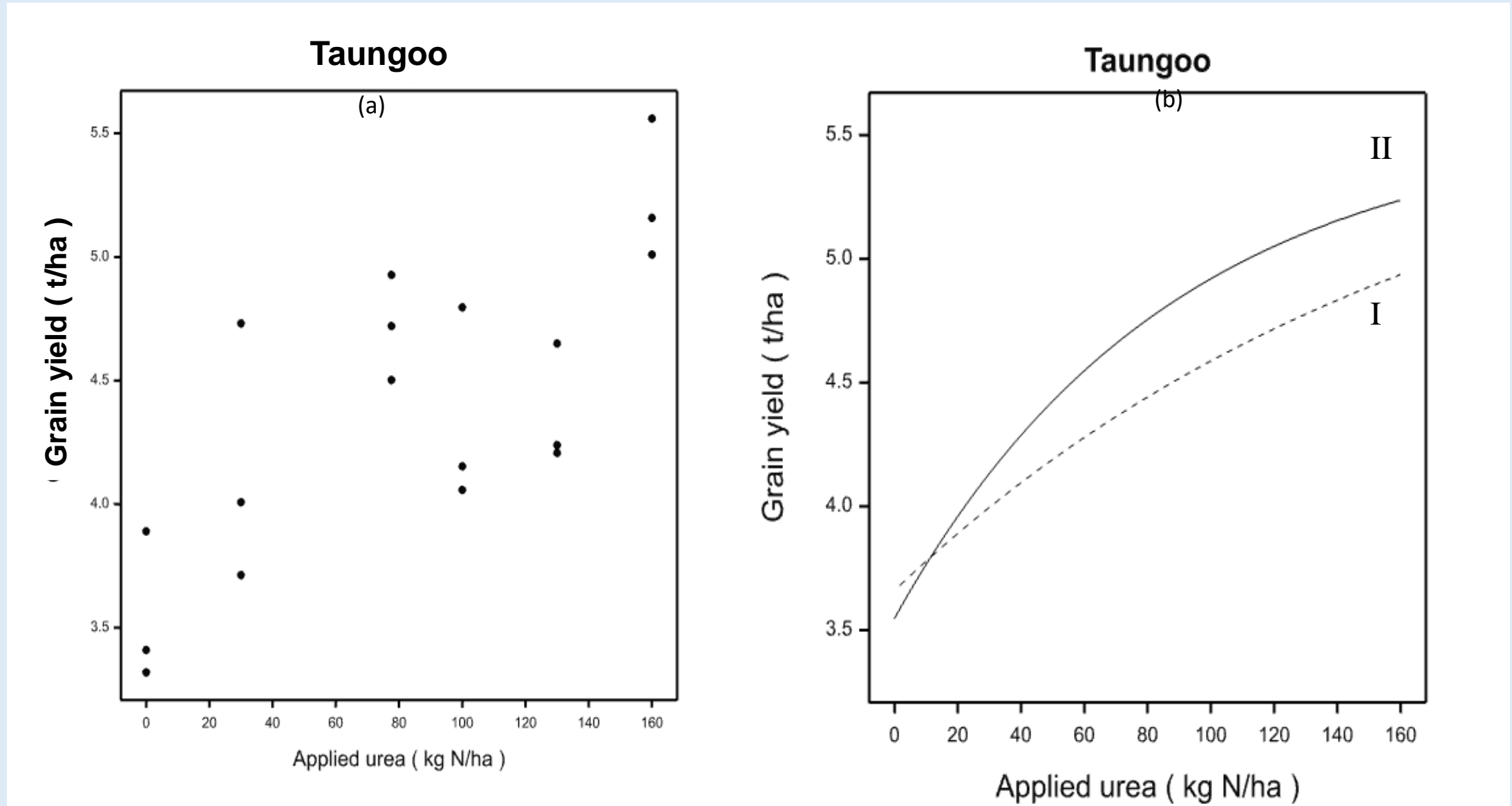


Crop grain yield response to N application rate (surface broadcast) at YAU Farm



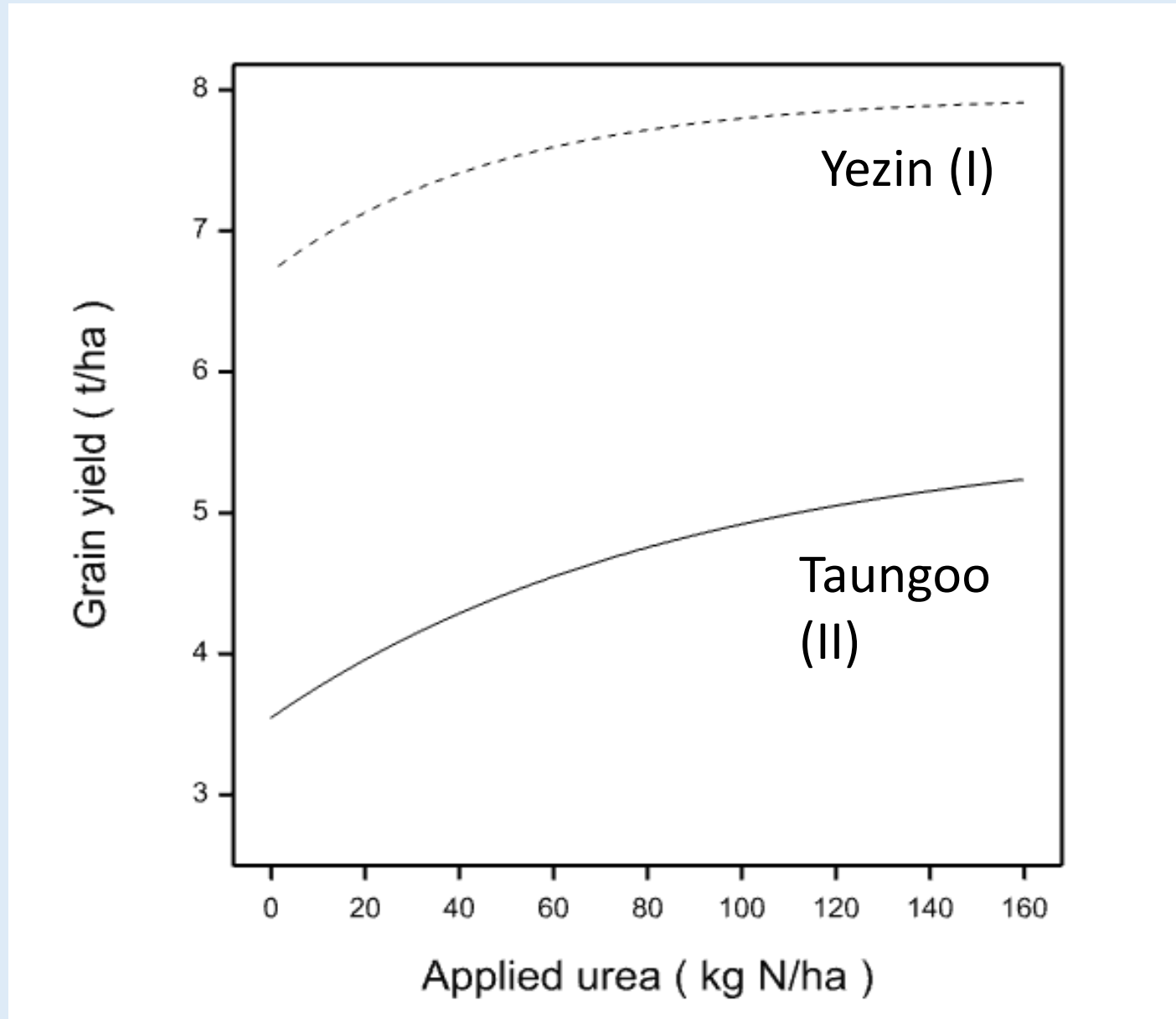
(a) individual data; (b) response curves I - fitted to whole dataset [$Y = 7.955 - 1.247 (0.9796^X)$; $P = 0.005$, $R^2 = 0.437$]; II - fitted to treatments 0, 77.6, 100 and 130 kg N/ha [$Y = 9.93 - 3.16 (0.9953^X)$; $P < 0.001$, $R^2 = 0.765$]

Crop grain yield response to N application rate (surface broadcast) at Taungoo



(a) individual data; (b) response curves; I - fitted to whole dataset [$Y = 5.79 - 2.13 (0.9943^X)$; $P = 0.002$, $R^2 = 0.498$] ;
II - fitted to treatments 0,30, 77.6, and 160 kg N/ha [$Y = 5.558 - 2.011(0.98859^X)$; $P < 0.001$, $R^2 = 0.792$]

A comparison of the dry season rice grain yield response curve (II) at the Taungoo site with grain yield response curve (I) for the YAU Farm site



Conclusions

- Results represent the earliest results from first field experiments
- Agronomic characters response to N application and method in vegetative stage and highest in USG treatment.
- A fair bit of variability in many treatment results, but some yield response trends evident
- 30 kg N/ha not enough for significant increase in yield
- 70 kg N/ha urea rate achieved a significant increase in yield (both surface and DUP)
- UDP higher yields than Surface broadcast @ 70 kg N/ha (variability led to $P>0.05$)

Current work:

- Still yet to fully analyse soil & plant samples for 'Dry Season rice field experiments'.
- NUE results from Micro plots receiving ^{15}N labelled urea as granular urea & '2.7g urea briquettes'.
- Currently have 'Monsoon rice' field experiments at Taungoo and Yezin sites.
- Maize field experiments just harvested at Laythar and Tatkon sites.
- All with ^{15}N labelled urea micro-plots to inform Nitrogen fertiliser use efficiency.

Acknowledgments

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Thank you for your kind attention!

