National Conference on Soil Fertility and Fertilizer Management in Myanmar

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Nutrient management for maximizing yield in rice-rice and rice-pulse cropping systems in lower Myanmar

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Rice Science for a Better World

OUTLINE OF PRESENTATION

- MyRice Project Goal and Objectives
- Project Location
- Objectives of the Study
- Experimental Design and Treatments
- Strategy of Implementation
- Results
- Conclusion
- MyRice TEAM

Goal of MyRice Project: To enhance sustainable productivity of rice-based systems in lower Myanmar*

Main objectives:

Raise cropping intensity to improve farmer livelihoods through

- improved resource use, post-harvest
- increases in crop diversity, and
- more efficient & profitable cropping patterns (rice-rice; rice-pulses)

*Environmentally sustainable

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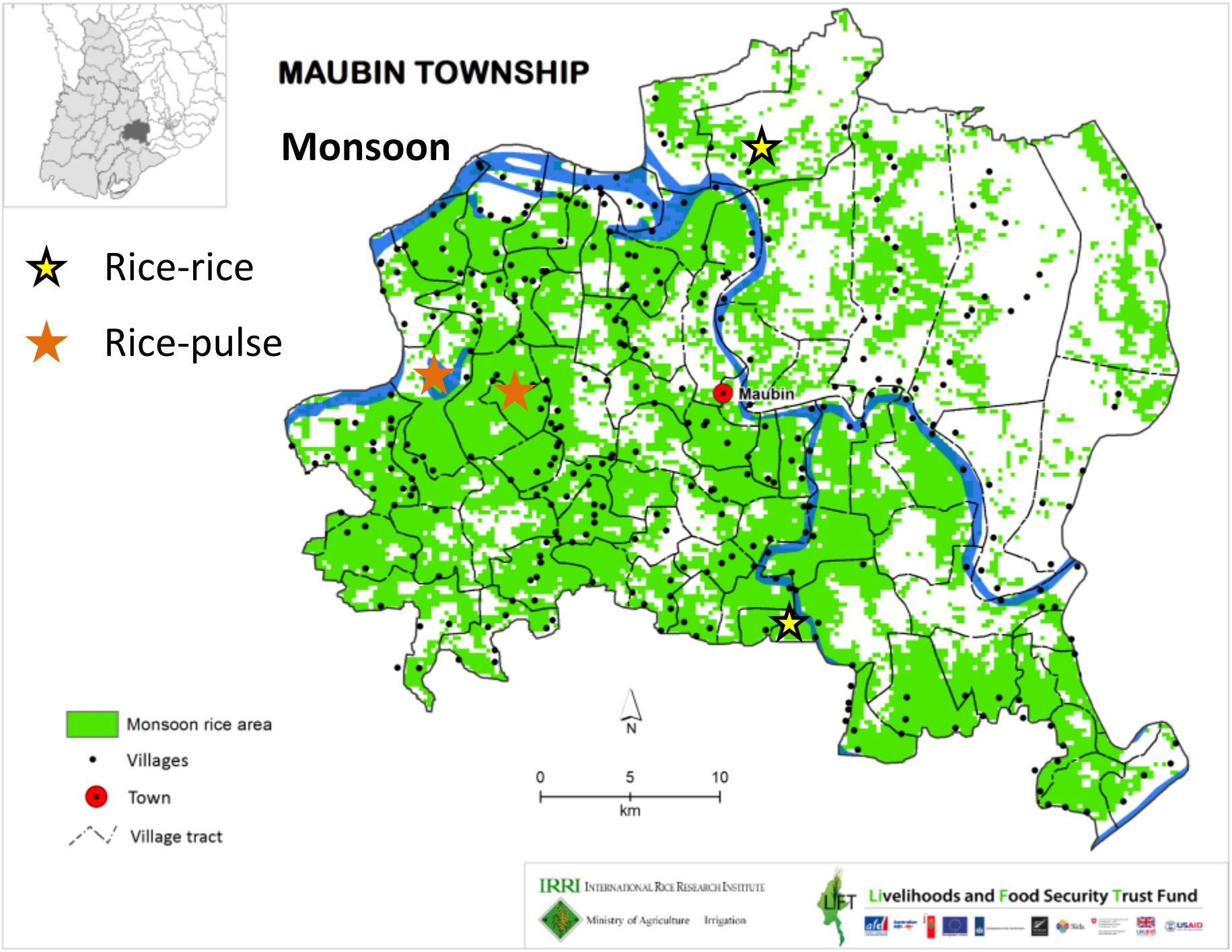
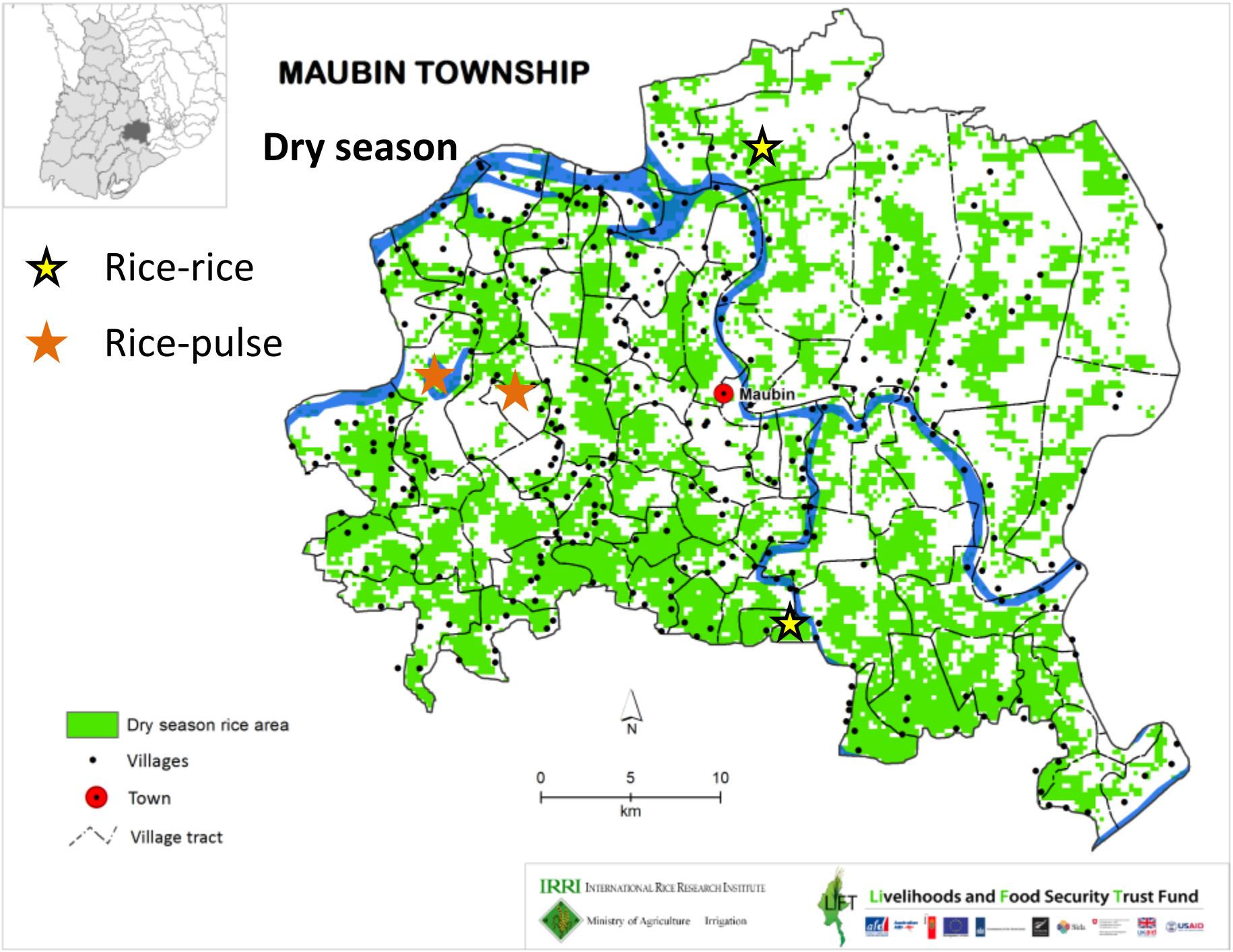
MyRice: 2 regions selected
470,000 ha rice; 280,000 ha pulses

	Monsoon rice	Dry season rice	Pulses
Ayeyarwady	2.3 t/ha	4.3 t/ha	0.9 t/ha
- HYV - traditional	99,150 ha 57,000 ha	81,000 ha	175,000 ha#
Bago	2.6 t/ha	2.7 t/ha	0.9 t/ha
	200,000 ha	32,500 ha	105,000 ha

Some pulses are grown along waterways where monsoon waters recede


MAUBIN TOWNSHIP
Monsoon
Rice-rice
Rice-pulse
Maubin
N
0
5
10
km
Monsoon rice area
Villages
Town
Village tract
IRRI INTERNATIONAL RICE RESEARCH INSTITUTE
Ministry of Agriculture Irrigation
LIFT
Livelihoods and Food Security Trust Fund


MAUBIN TOWNSHIP
Dry season
Rice-rice
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Maubin
Dry season rice area
Villages
Town
Village tract
N
0
5
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km
IRRI INTERNATIONAL RICE RESEARCH INSTITUTE
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OBJECTIVES OF THE STUDY

- To demonstrate the importance of raising healthy seedlings by using raised seed bed.
- To show the importance of balance nutrition for rice in rice-rice and rice-pulse cropping systems.

EXPERIMENTAL DESIGN AND TREATMENTS

Treatment 1 = farmer seedbed management + farmer practice of nutrient management in the field after transplanting	Treatment 2 = farmer seedbed management + improved nutrient management in the field after transplanting (DAR recommendation)
Treatment 3 = improved seedbed management + farmer practice of nutrient management in the field after transplanting	Treatment 4 = improved seedbed management + improved nutrient management in the field after transplanting (DAR recommendation)

Rice-Rice system

- Four combinations of nursery and fertilizer management
- Treatment Plot size - 1,000 m^2
- Three to four farmers served as replication

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EXPERIMENTAL DESIGN AND TREATMENTS

T1 = wet season rice		T2 = wet season rice	
T1 = dry season pulse	T2 = dry season pulse	T1 = dry season pulse	T2 = dry season pulse
T3 = wet season rice		**T4 = wet season rice**	
T1 = dry season pulse	T2 = dry season pulse	T1 = dry season pulse	T2 = dry season pulse

Rice-Pulse system

- Same treatment combinations as in the WS rice-rice
- Two P rates/plot – T1= 61.75 kg ha^{-1} triple superphosphate (farmer practice applied as basal)
- T2 = 12.5 kg N, 25 kg P_2O_5, 12.5 kg K_2O, and 10 kg S ha^{-1} (DAR recommendation applied as basal)
- Three to four farmers served as replication

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Rice-Rice System	Maubin	Daik U
Soil pH (reaction)	5.6	6.0
Organic matter (%)	3.0	1.2
Available N (mg/kg)	61.0	71.0
Available P (mg/kg)	10.7	6.7
Available K (mg/kg)	167.7	90.7
Soil texture	Sandy loam Sandy clay loam	Sandy loam Loamy sand

Rice-Pulse System	Maubin	Daik U
Soil pH (reaction)	5.9	6.7
Organic matter (%)	2.6	1.2
Available N (mg/kg)	97	85
Available P (mg/kg)	14	7
Available K (mg/kg)	124	134
Soil texture	Silt loam	Silt loam

DAR soil analysis, May 2014

NUTRIENT MANAGEMENT

	Farmers' Practice	Improved Management
Nursery management for 1 ha field	1,000 m^2 divided into 4-5 small plots	Raised beds; 1 m (W) x 20 m (L) x 20 cm (H)
Seeding rate in nursery	103 kg ha^{-1}	100 g of seeds per m^2
Nursery fertilizer mgt.	Urea (21 kg ha^{-1}) at 7-10 days after sowing (DAS) and at 24 DAS.	52 kg N – 40 kg P_2O_5 – 5 kg $ZnSO_4$ ha^{-1} 10 g $ZnSO_4$ per 20 m^2 (before seeding); OM cover 540 g of 15-1-5-15 per 20 m^2 (7 DAS) 50 g of urea (46-0-0) per 20 m^2 (7-10 d before uprooting)

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NUTRIENT MANAGEMENT

	Farmers' Practice	Improved Management
Nutrient management before and after transplanting	R-R: 34 kg N - 6.2 kg P_2O_5 - 3 kg K_2O ha^{-1}. mixed & applied at 15 DAT R-P: 15 kg N, 22 kg P_2O_5, 9 kg K_2O, and 6 kg S ha^{-1} *1/2 N 10 & 25 DAT; 1/3 P_2O_5 10 DAT, 2/3PI; K at PI; S 10 DAT.*	WS: 58 kg N – 28 kg P_2O_5 – 20 kg K_2O – 8 kg S ha^{-1} DS: 87 kg N – 28 kg P_2O_5 – 38 kg K_2O – 8 kg S ha^{-1}. *P_2O_5 and S as basal; N in 3 splits (7 DAT, MT, PI); K_2O in 2 splits (7 DAT, MT)*

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Seedbed in R- P system

Farmers' nursery in R-P system

Farmer nursery in R-R system

Seedbed in R-R system

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FP’s Nutrient Management after transplanting
Nutrient Management after transplanting

NUTRIENT MANAGEMENT

	Farmers' Practice	Improved Management
Nutrient management for black gram	61.75 kg ha^{-1} TSP as basal with no seed treatment and rhizobium inoculation	Seed treatment & inoculation of Rhizobium culture before planting (1 pk/ac) 12.5 kg N, 25 kg P_2O^5, 12.5 kg K_2O, and 10 kg S ha^{-1}as basal and incorporated before sowing seed


INM in pulses


FPNM in pulses

IRRI

RESULTS

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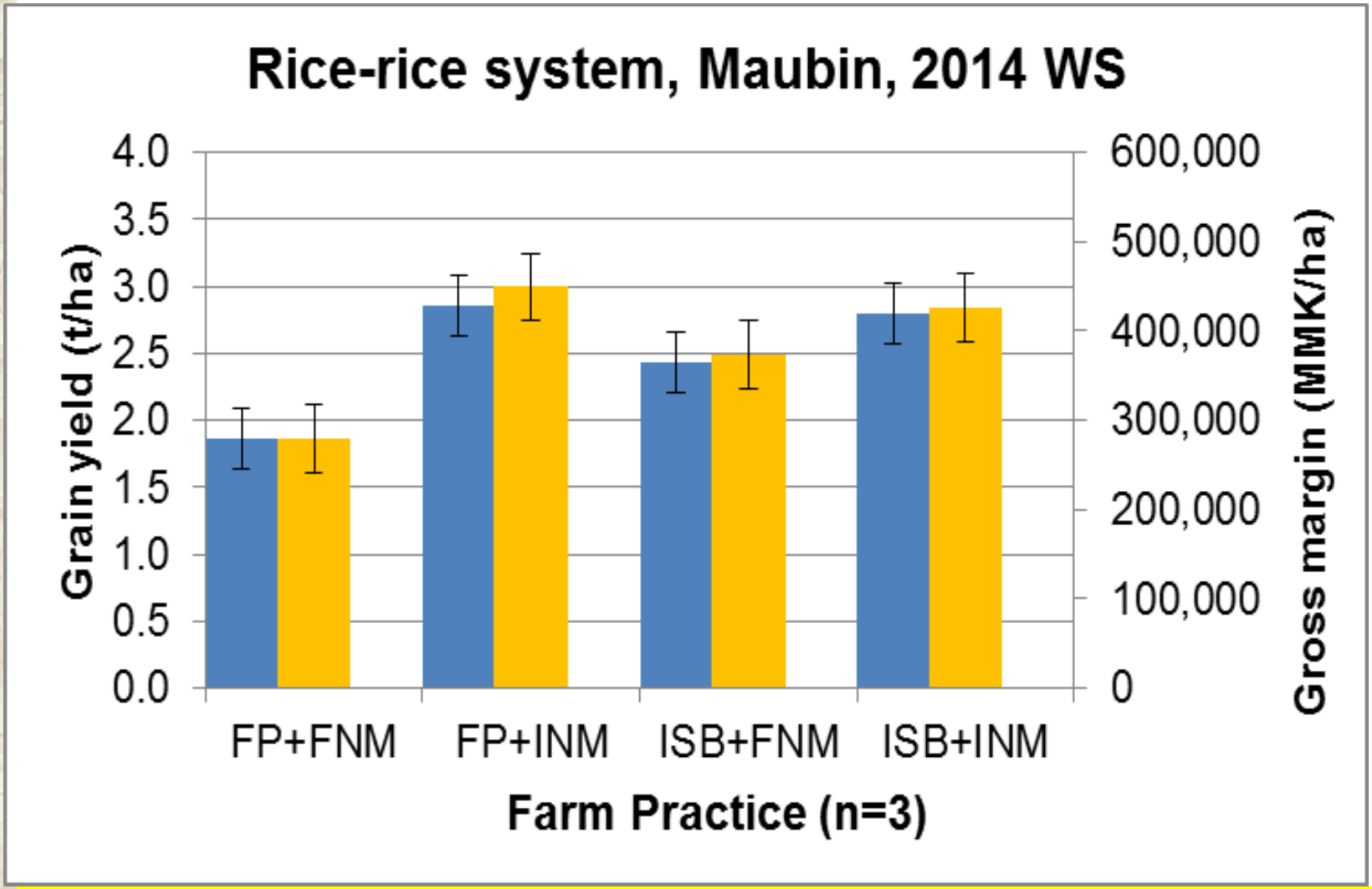
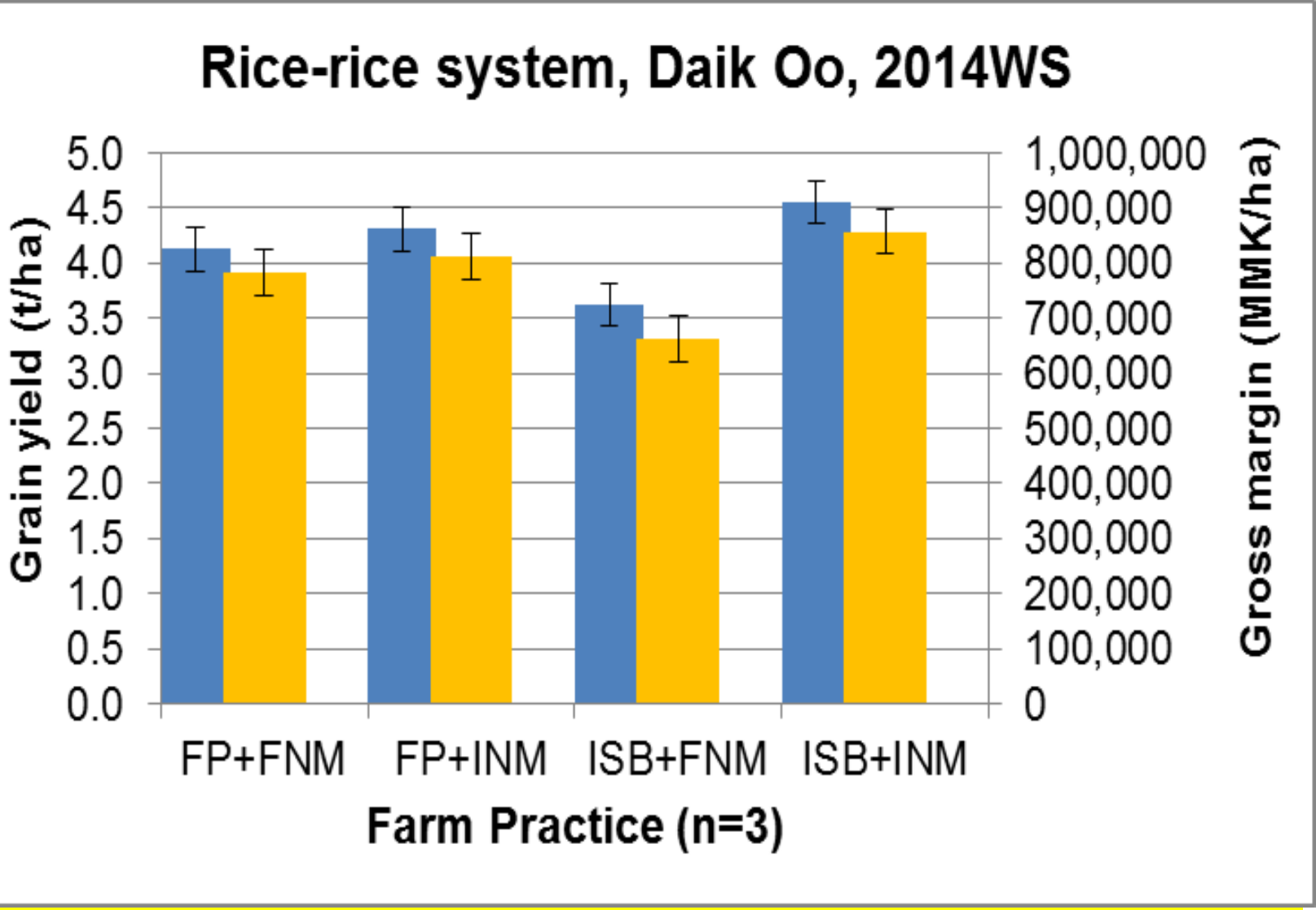


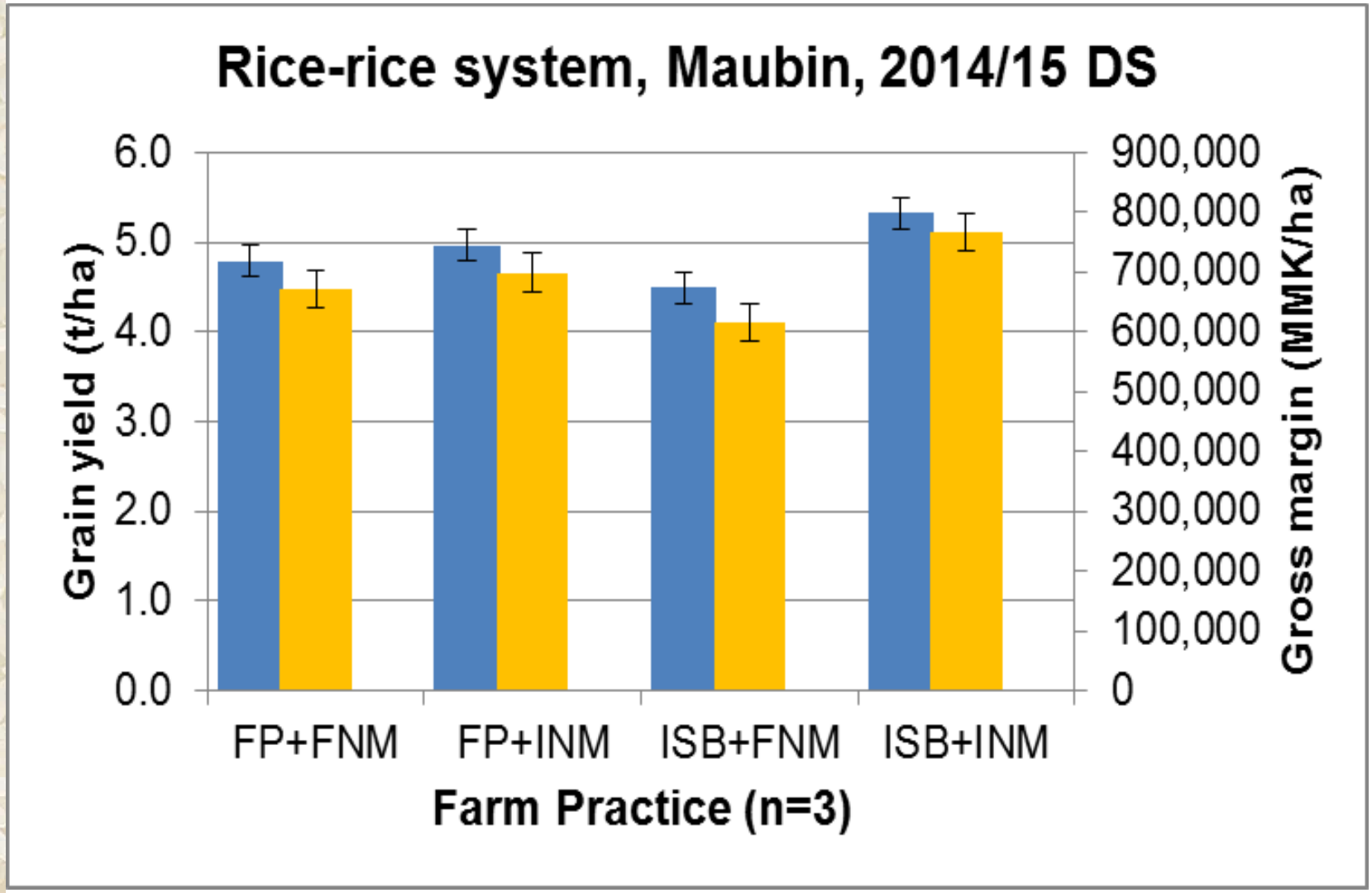
T4 - 50% higher yield than T1 (2.8 vs 1.9 t ha^{-1} ± 0.23 SE) ; 41% higher in production cost and 53% higher income.

T2 - 53% higher yield than T1 (2.9 vs 1.9 t ha^{-1} ± 0.23 SE); 23% higher in production cost and 61% higher income.



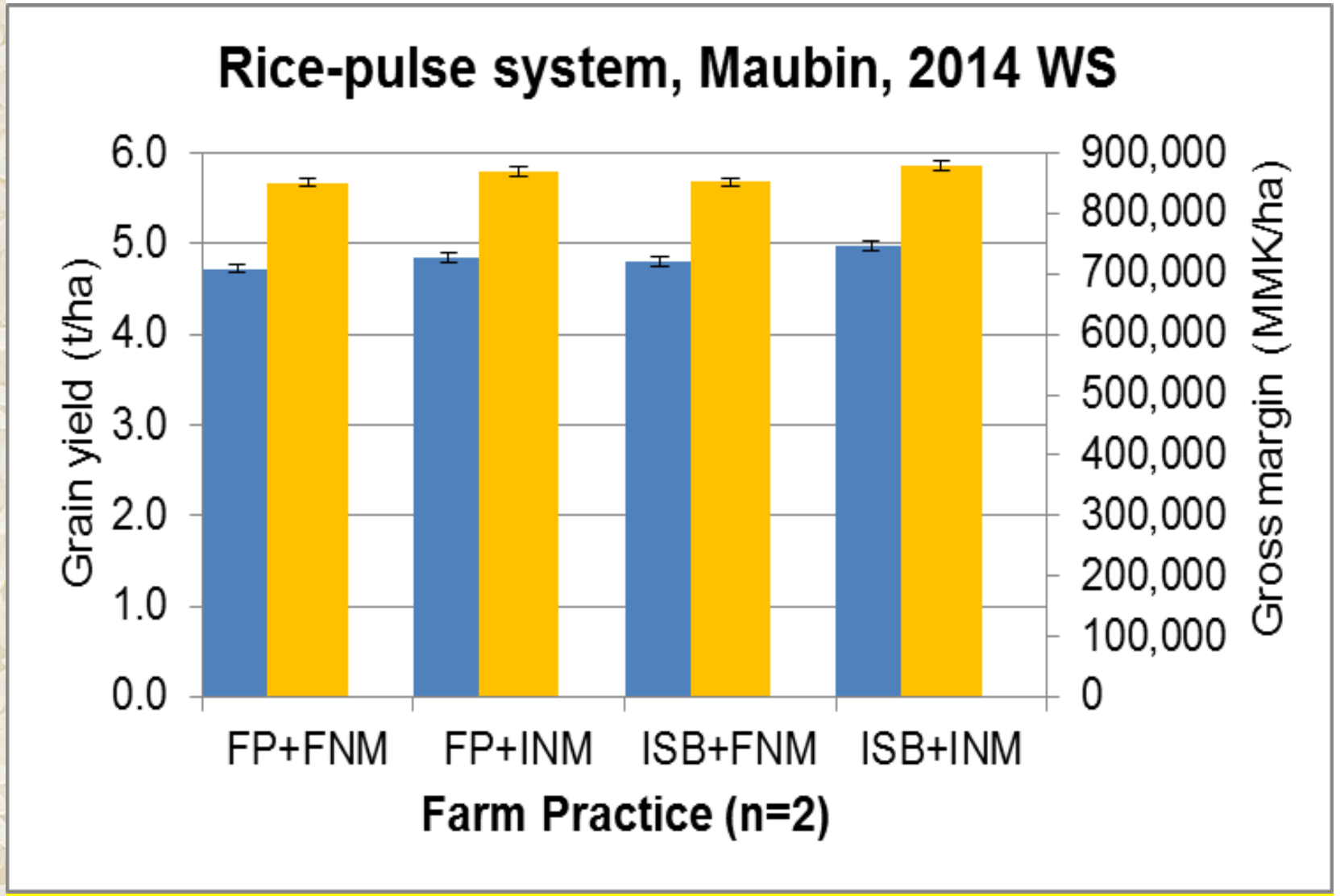
T4 -10% higher yield than T1 (4.6 vs 4.1 t ha^{-1} ± 0.20 SE); 30% higher in production cost and 10% higher income

T2 - 4.0% higher yield than T1 (4.3 vs 4.1 t ha^{-1} ± 0.20 SE); 15% higher in production cost and 4.0% higher income.



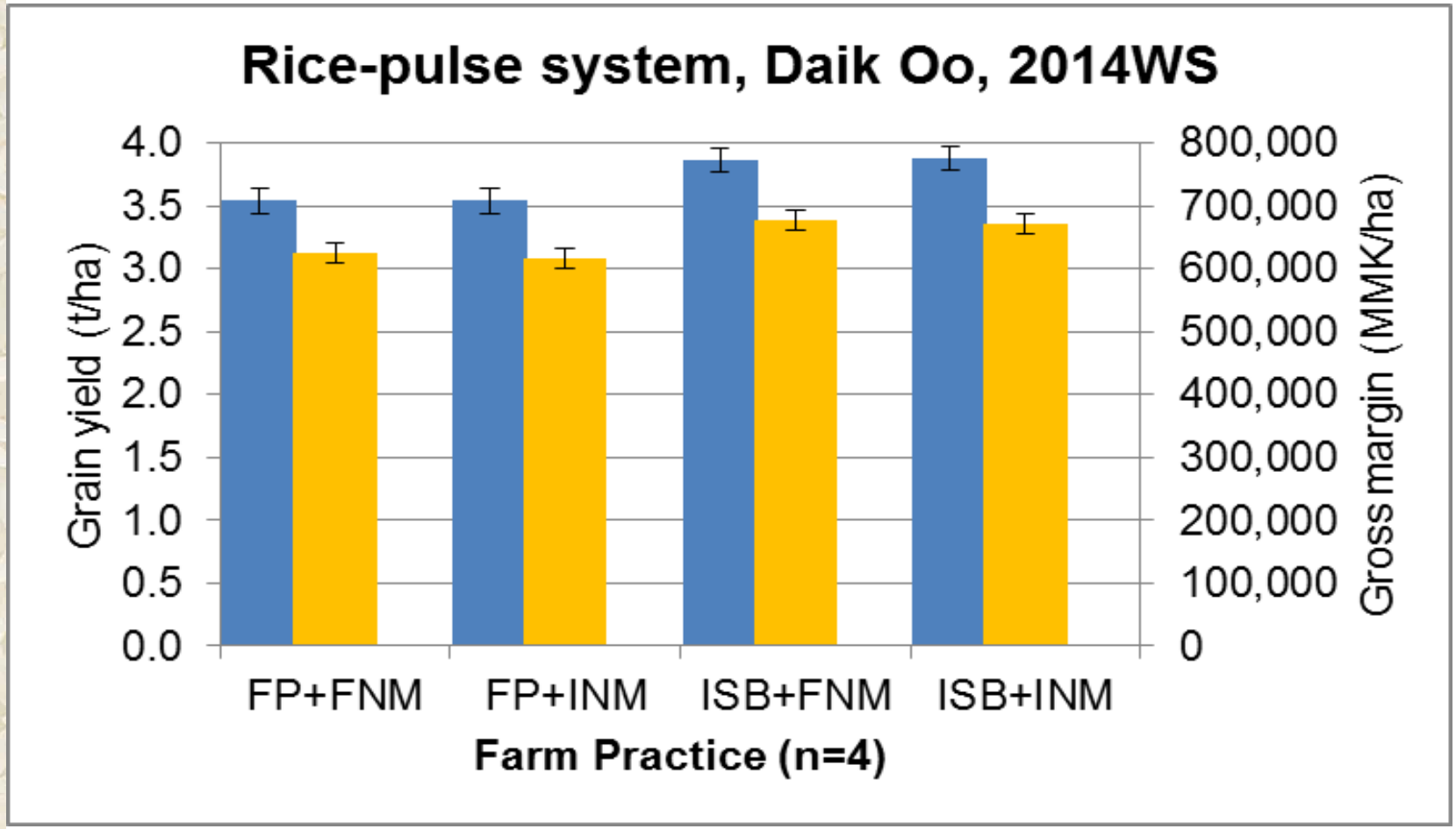
T4 -11% higher yield than T1 (5.3 vs 4.8 t ha^{-1} ± 0.17 SE); small increase in production cost but 14% higher income.

T2 - 4.0% increase in yield than T1 (5.0 vs 4.8 t ha^{-1} ± 0.17 SE); 1.3% higher in production cost and 4.2% higher income



T4 - 5.0% higher yield than T1 (5.0 vs 4.7 t ha^{-1} ± 0.05 SE); 40% higher production cost and 3.0% higher income.

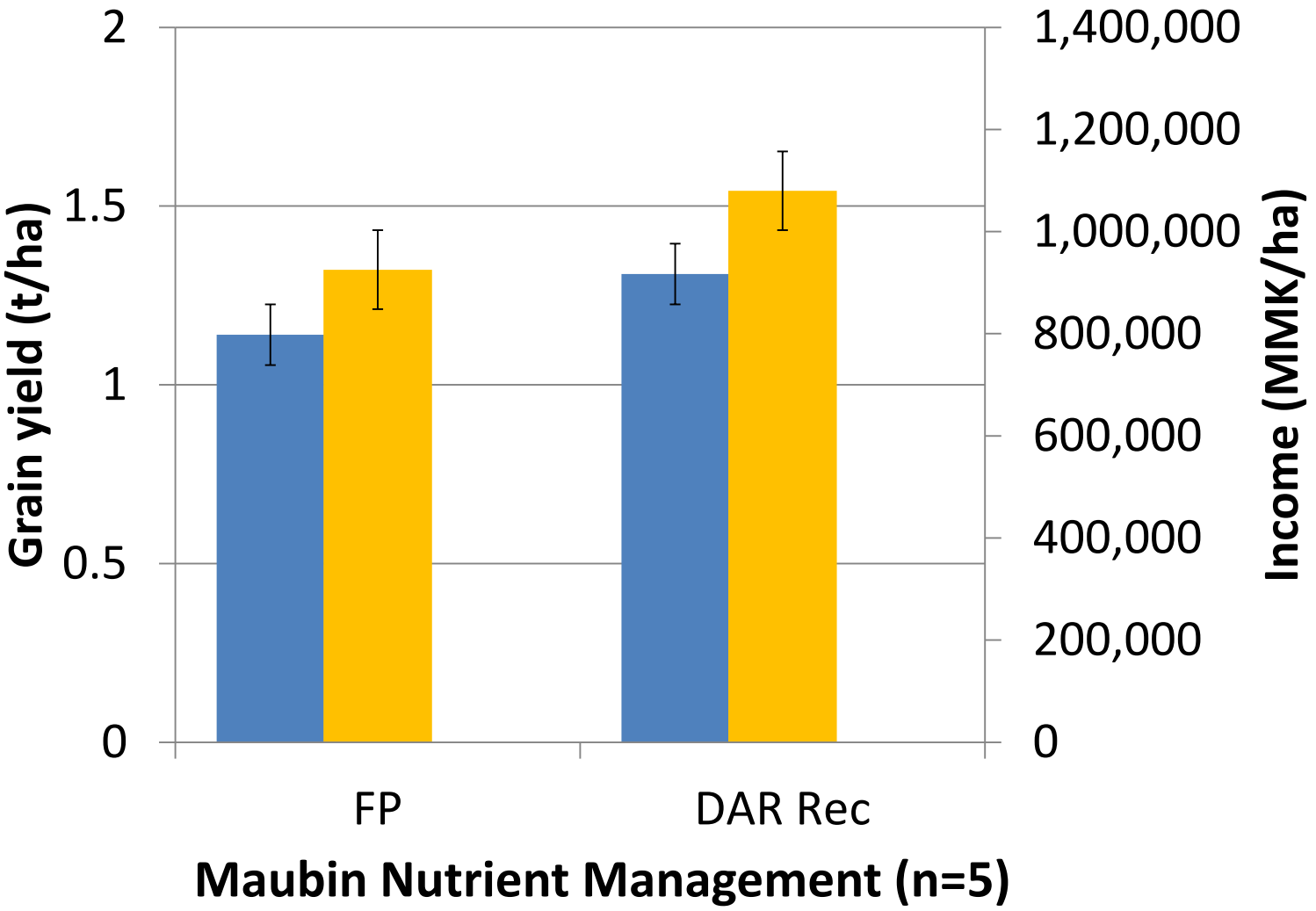
T2 - 3.0% higher yield than T1 (4.9 vs 4.7 t ha^{-1} ± 0.05 SE); 13% higher production cost and 2.0% higher income .



T4 -10% higher yield than T1 (3.9 vs 3.5 t ha^{-1} ± 0.10 SE); 40% increase in production cost and 8.0% increase in income.

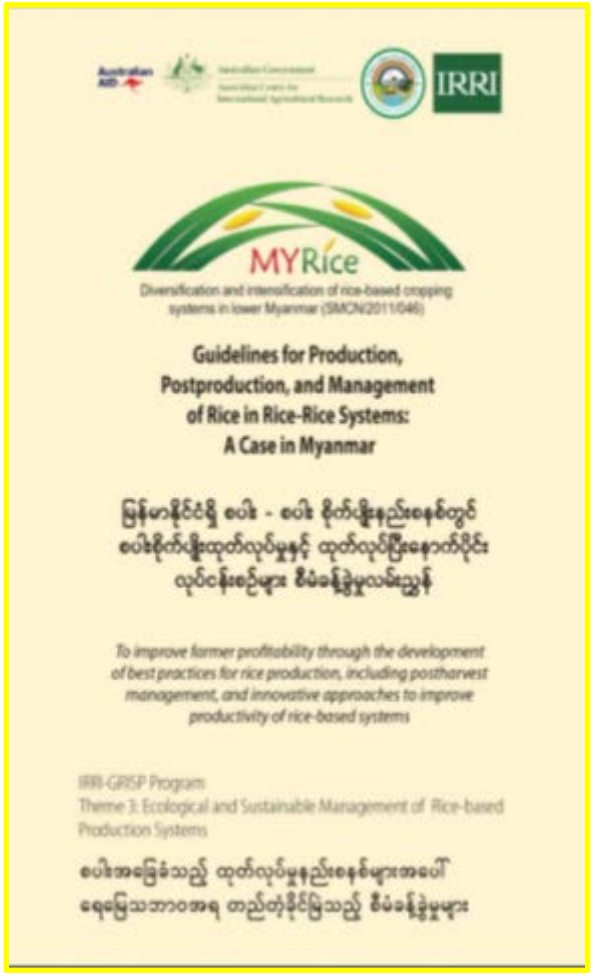
No increase in yield between T2 and T1 (3.5 vs 3.5 t ha^{-1} ± 0.10 SE); 17% higher production cost and lower income by 1.4% .

The additional production cost did not provide a considerable increase in yield and income.



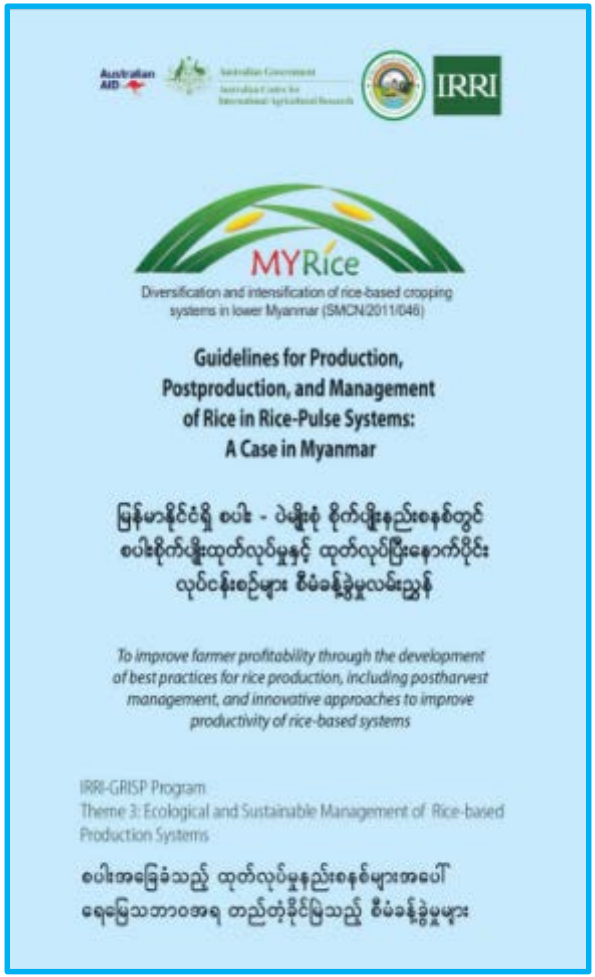
DAR recommendation for black gram: 12.5 kg N, 25 kg P_2O_5, 12.5 kg K_2O, and 10 kg S ha^{-1} as basal; FP: TSP at 61.75 kg ha^{-1} basal. DAR rec - 15% higher yield and 17% higher income than FP across five locations; 9.0% higher production cost than FP.

Production & Post Production Guides



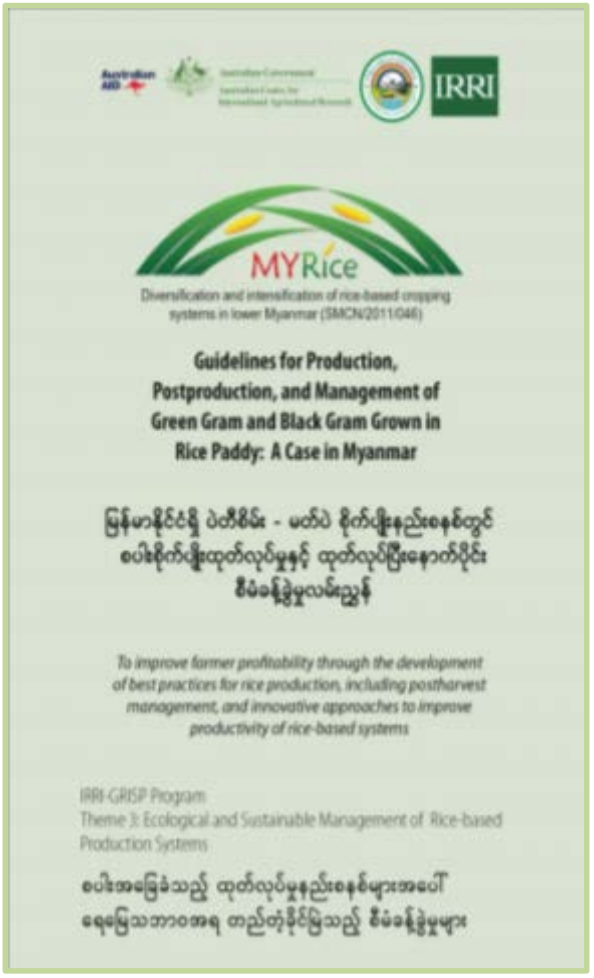
Rice-Rice 54 p

http://aciar.gov.au/publication/cop30



Rice-Pulse 58 p

http://aciar.gov.au/publication/cop28



Green gram & Black gram 52 p

http://aciar.gov.au/publication/cop29

Stories of change- Farmers' testimonies

Rice-Rice system
Tar Pat Village,
Maubin Township

U Nay Lin Oo is a village head and has been growing rice for 17 years. He is also a cooperator in the nutrient management trial in the 2015 wet season using variety Sin Htwe Latt and in the 2015-16 dry season using Htee Htat Yin. He learned the importance of adding muriate of potash fertilizer in addition to triple superphosphate (TSP) and urea, following the protocol. Before the trials, he used only TSP and urea. Although the use of MOP entails added cost, this is offset by higher yields. Some farmers in the village are thus now following the steps for the proper amount and timing of fertilizer application

Stories of change- Farmers' testimonies

Rice-Pulse system
Phaung Wae Village,
Daik-U Township

U San and Daw Auntie, husband and wife, have been farming rice and pulses for 20 years. "We were taught how to establish a seedbed and apply (a) triple superphosphate fertilizers as basal, (b) muriate of potash at 7 days after transplanting (DAT) and at maximum tillering stage, and (c) urea at 7 DAT and maximum tillering and panicle initiation stages to boost our yield," said Daw Auntie. " We have learned a lot. Seeing how yield has differed from that of the rest of our field where we used traditional practices, I have seen how the BMPs work."

U Hla Myint, Regional Director, Bago Region, Department of Agriculture

The MyRice project brought in best management practices that helped farmers improve yields, and increased their income. The project built the confidence of DoA staff in providing advice to farmers because they were involved in field demonstrations. They had direct personal evidence of the benefits of new approaches and technologies.

We'll ensure that the results of this project are extended to other parts of Myanmar."

Outreach 2017 WS

- 3 Districts
- 12 Townships
- 87 Villages
- 655 Farmers
- 407 hectares

Rice-Rice: 397 farmers

Rice-Pulse: 460 farmers

PLANS BEYOND 2017

- One Village one District BMP demonstration through the Rice Division of DoA, MoALI (National initiative)
- Bago & Ayeyarwady region: Roll-out:
  1) Large scale use of new improved varieties + drum seeder to replace farmers practice of broadcasting seeds
  2) Large-scale seed production:

     Distribution of Pyitawyin variety, for monsoon rice in rice-pulse system; Yaenelo 7 for summer rice in rice-rice system
  3) Balanced nutrient management, particularly K fertilizer, for better crop growth, high yield and good quality harvest.
  4) Postharvest management including thresher, dryer, IRRI super bags for rice and pulses.
  5) Training on integrated insect, disease, weed and rodent management

CONCLUSION

- In both systems, partial cost-benefit analyses showed positive results.
- Improving seedbed and nutrient management during the nursery stage and after transplanting resulted in higher yield and income in both townships.
- According to the project objectives, the importance of healthy seedlings through improved seedbed and nutrient management can be demonstrated to the farmers.
- Moreover, balanced nutrition with improved nutrient management is also imperative in rice-based cropping systems.

IRRI-ACIAR MyRice PROJECT TEAM

IRRI HQ

Dr. Grant Singleton – Program Leader; Dr. David Johnson – GIS, weeds
Engr. Martin Gummert – Post Harvest; Engr. Christopher Cabardo – Post harvest;
Ms. Arie Malabayabas – Economist; Ms. Reainne Quilloy- Communication Specialist

IRRI MO

Dr. Romeo Labios – Scientist II
U Than Aye – Consultant
Daw Tin Tin Myint - Consultant
Yan Lin Aung – Asst. Scientist
Su Su San - Asst. Scientist
Aung Myo Thant– Researcher
Hlwan Oo – Researcher

DAR

U Than Lwin Oo –Dy DG & Project Manager
Daw Myint Yi – Head, Rice Dept
Dr. Su Su Win – Dir. Soils, Ag Engr. Division
Dr .Tun Shwe – Dir. Cereals & Legumes Division
Daw ChoCho Aung – Researcher
Daw Myat New New Research Officer
U Zaw Moe Aung –Senior Researcher

DoA

U Hla Myint Aung – Deputy DG for R & D
Daw Jenny Lou - Dir. Planning Div
U Tun Aung Kyaw – Regnl Dir., Ayeyarwady
U Hla Myint - Regional Dir, Bago
Dr. Aye Min – Asst Director & Proj Manager
Daw Thuzar Myint – Director, Rice Division

Dr. Nyo Me Htwe – Deputy Staff Officer, PPD
– Asst. Director, Maubin District
U Hlay Myint – Asst. Director, Bago District

Plus DoA Staff at township level:
Maubin (8); Daik Oo (10)

THANK YOU…..

Australian Aid

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