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Country report on rice cultivation practice: Cambodia

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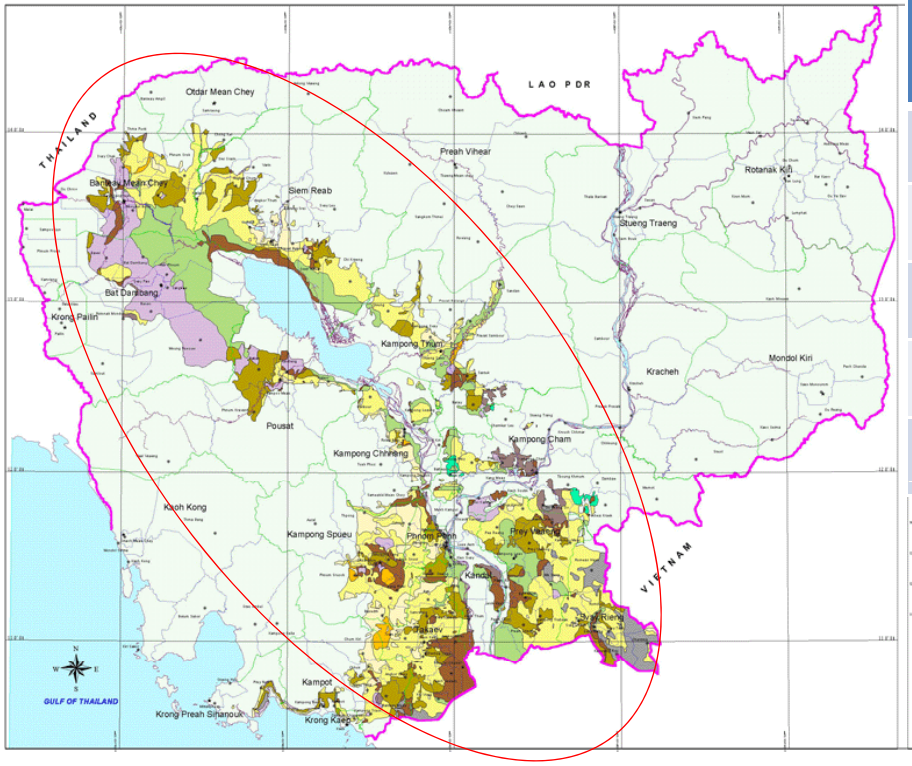
Bangkok, Thailand

Outline

- General Information
- Rice Variety
- Ecosystem
- Rice cultivation practice
- Management of Rice Residues
- Rotation Crops
- Soil Organic Carbon
- Socio-economic Status of Rice Farmer

General Information

Current status of rice production in Cambodia

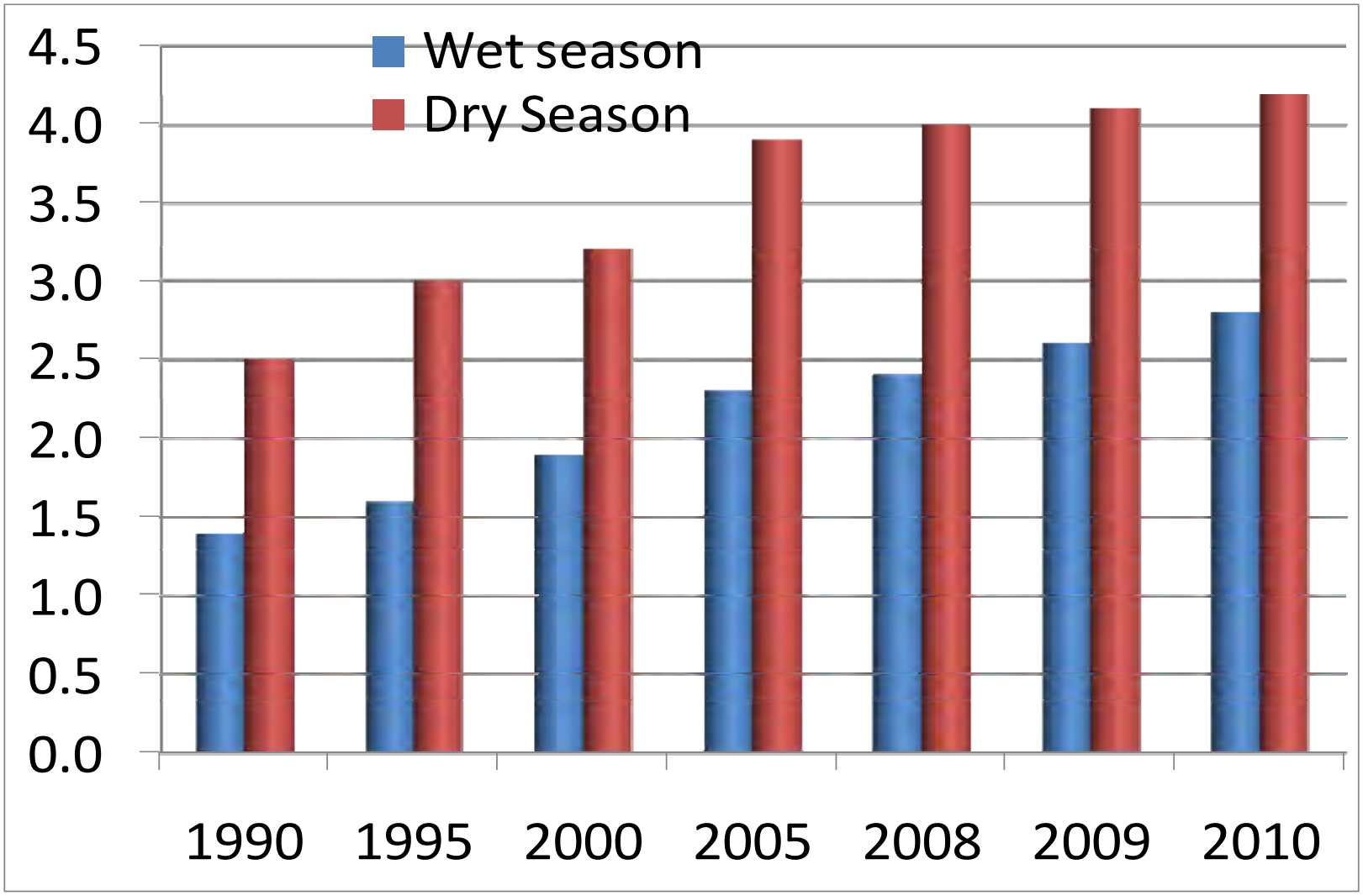


	2010	Relative to 2009 (%)
Cultivated area (mil ha)	2.80	↑2.82
Harvested area (mil ha)	2.78	↑3.84
Average yield (t/ha)	2.97	↑4.74
Total production (mil t)	8.25	↑8.75
Paddy surplus (mil t)	3.93	↑12

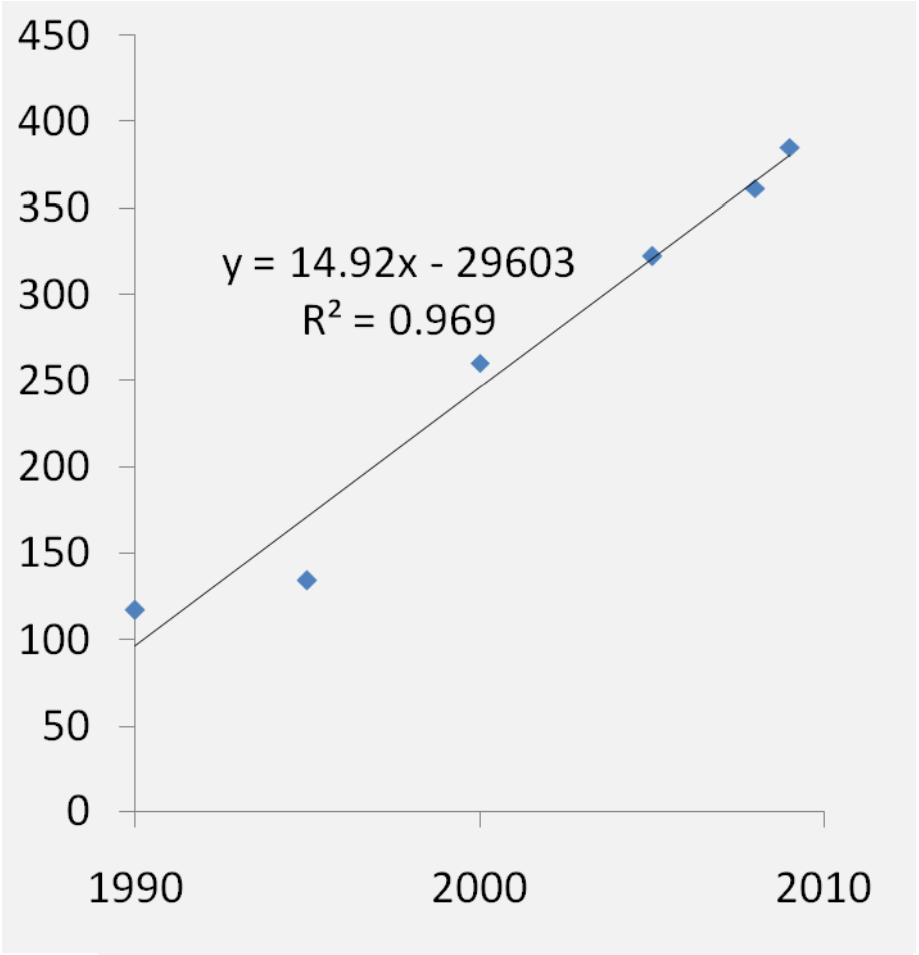
Data source: MAFF (2011)

Map of the main rice-growing areas in Cambodia

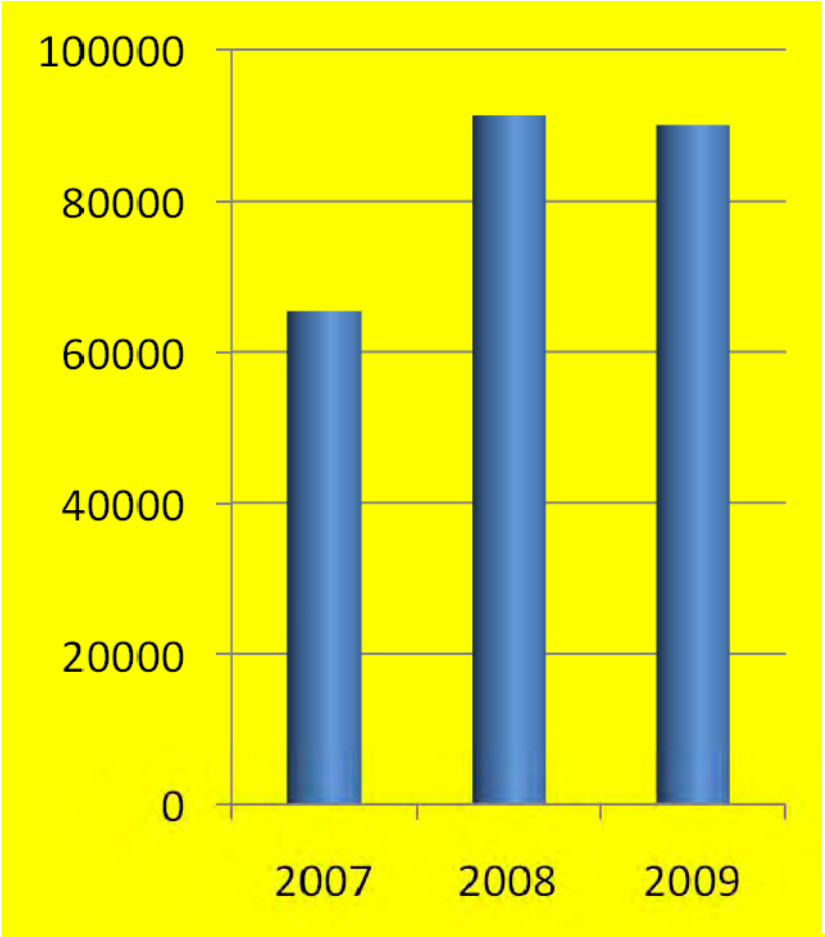
Average rice yield (t/ha) in wet season and dry season



Trends of cultivated area for dry season (‘000 ha) and early wet season (ha) rice

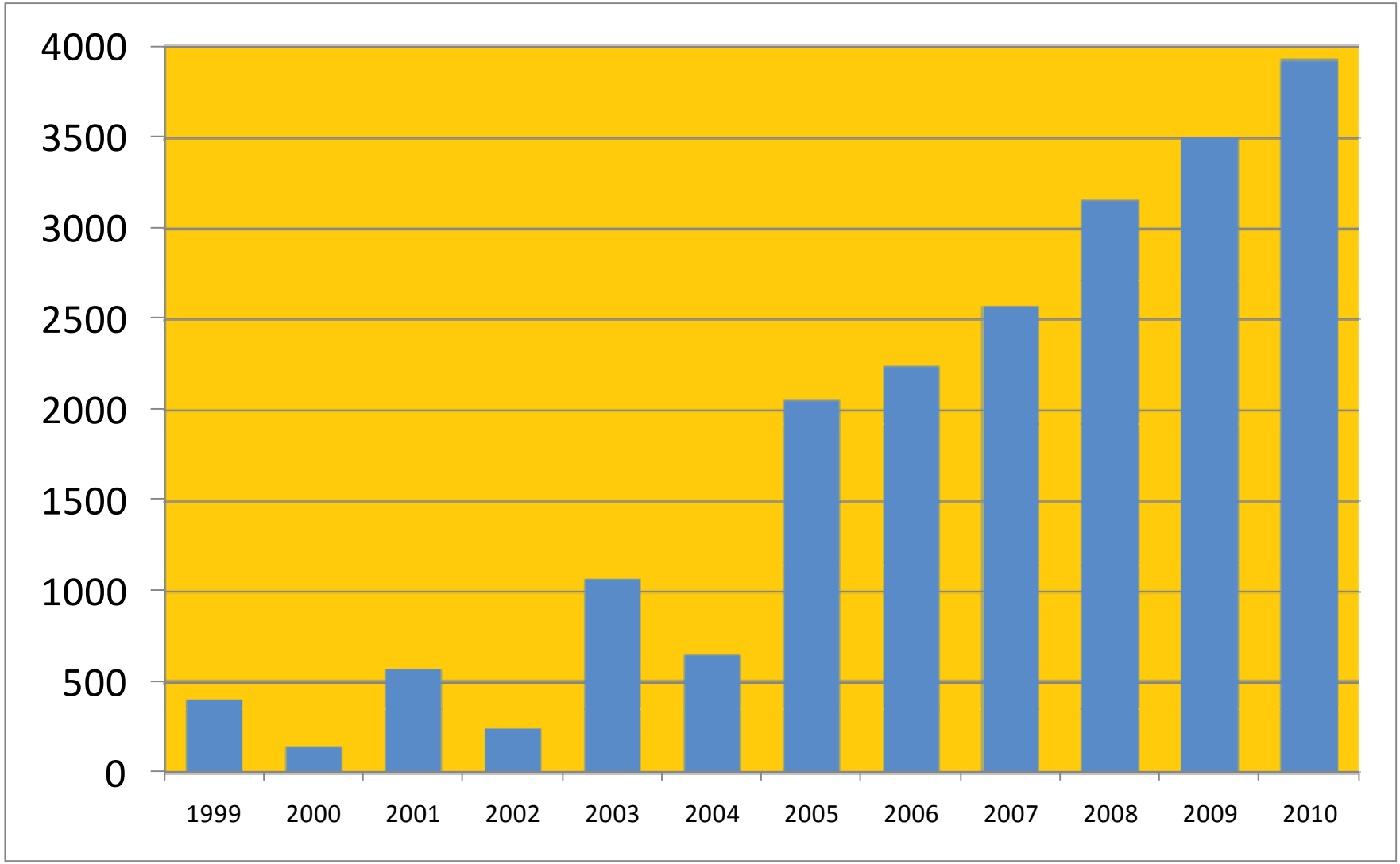


Dry season rice

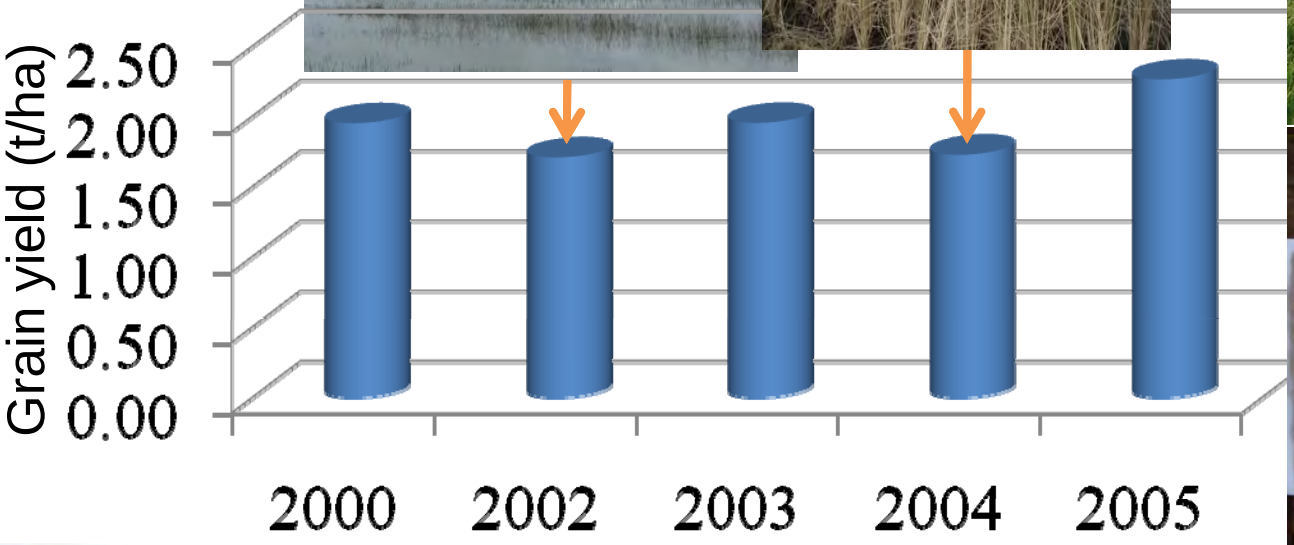


Early wet season rice

Surplus of paddy rice: 1999-2010 ('000 t)



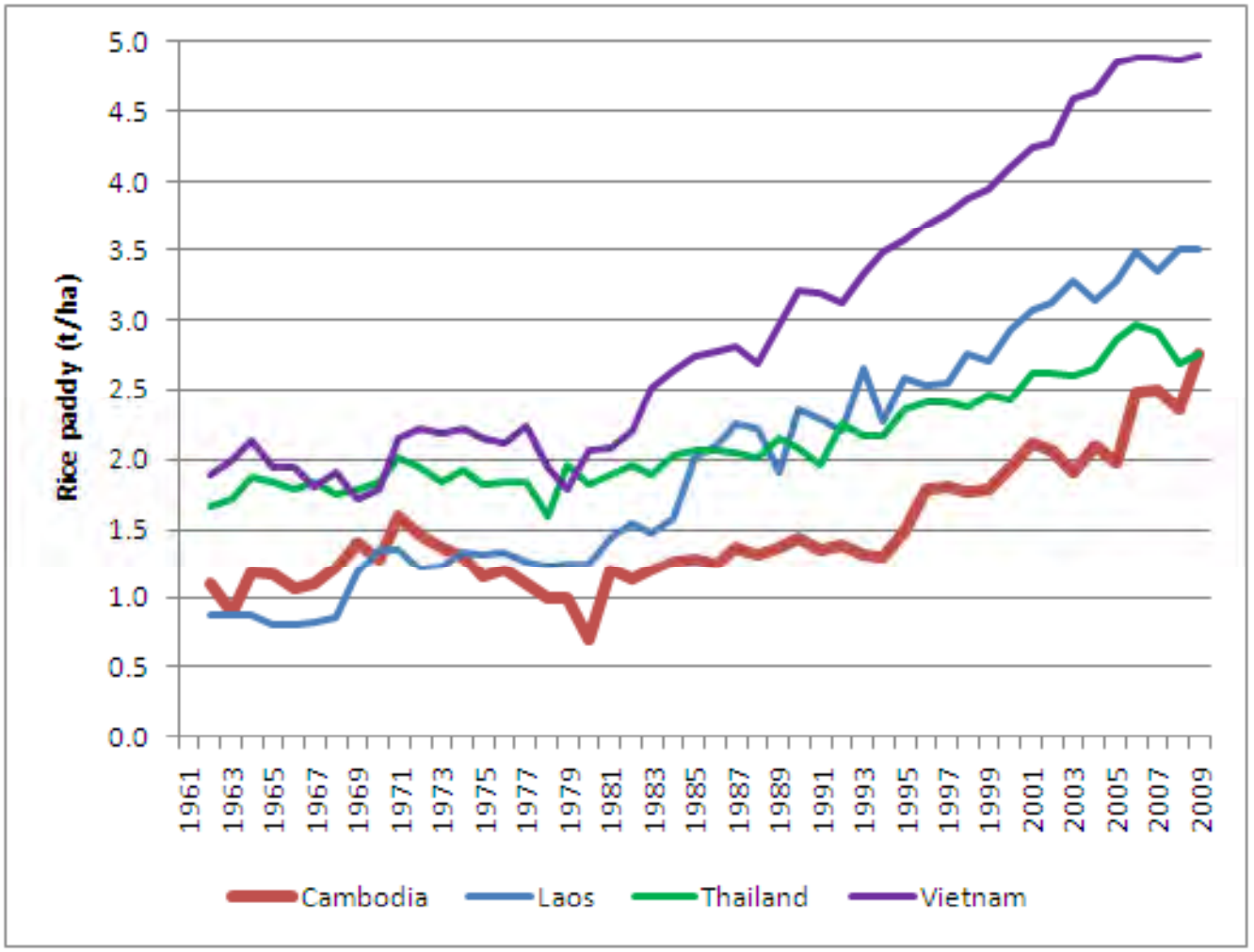
Why variable productions?



Rats, birds, BPH, leaf caterpillars, stem borers

Bacterial leaf blight and streak, brown spot

Cambodia's rice yield compared to neighbouring countries



Rice Variety

Crop Variety Released: Rice=38 varieties

Rainfed lowland and Irrigated : *33*

- Early duration : 9
- Medium duration insensitive : 5
- Medium duration sensitive : 6
- Medium duration aromatic : 5
- Long duration sensitive : 8

Upland : *2*

Deepwater : *3*

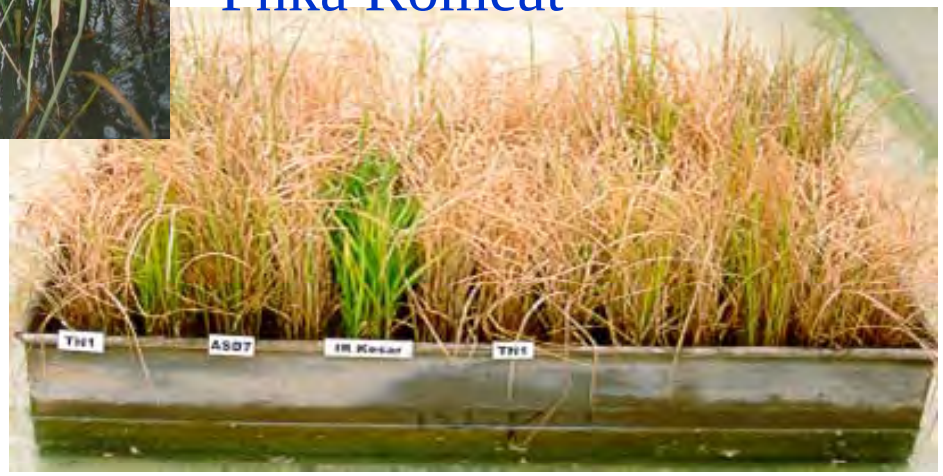
Rice varieties tolerant to environmental stresses

Tolerant to 10-12 days submergence:

CAR9, Phka Romduol and Phka Romdeng

Tolerant to 7-10 days submergence:

CAR6, Phka Romchek and Phka Romeat



Tolerant to moderate drought:

CAR3 and CAR4

Moderate resistant to BPH:

IRKesar, Kru, Chul'sa and CAR12

Resistance to stripe stem borer:

Kru, IR72, Sen Pidao and IR66

Ten Rice Varieties Promoted by the RGC from 2011

Early maturity

1. Sen Pidao
2. Chul'sa
3. IR66

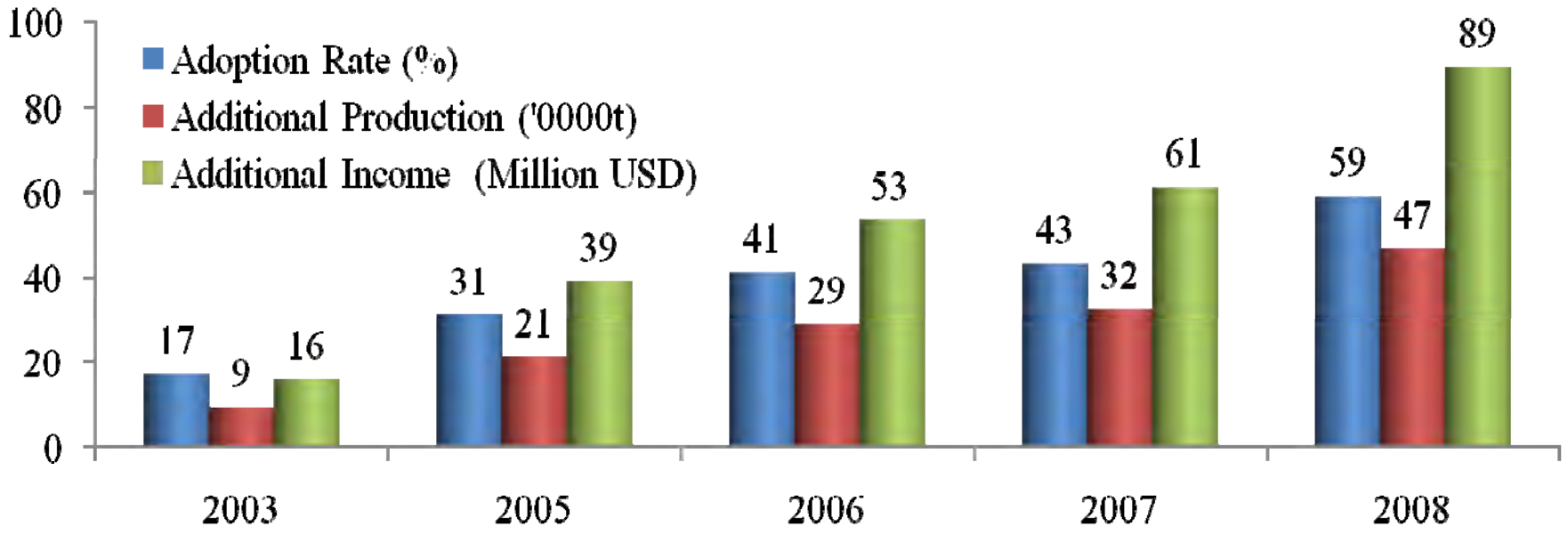
Intermediate maturity

1. Phka Rumdoul
2. Phka Romeat
3. Phka Romdeng
4. Phka Chan Sen Sar

Late maturity

1. Riang Chey
2. CAR4
3. CAR6

Impact of Rice Variety Improvement



Rice Genebank at CARDI

Accession: 2557
(in 3 catalogues)

Rainfed Lowland : 88.0%
Irrigated : 0.2%
Deepwater/Floating: 1.2%
Upland : 10.6%
Mild Aromatic : 10.0%
Strong Aromatic : 0.2%
Glutinous : 8.4%
Insensitive : 7.0%
Mild sensitive : 4.5%
Moderate sensitive: 30.7%
Strong sensitive : 60.1%

Ecosystems

Rainfed Lowland: 80.2%

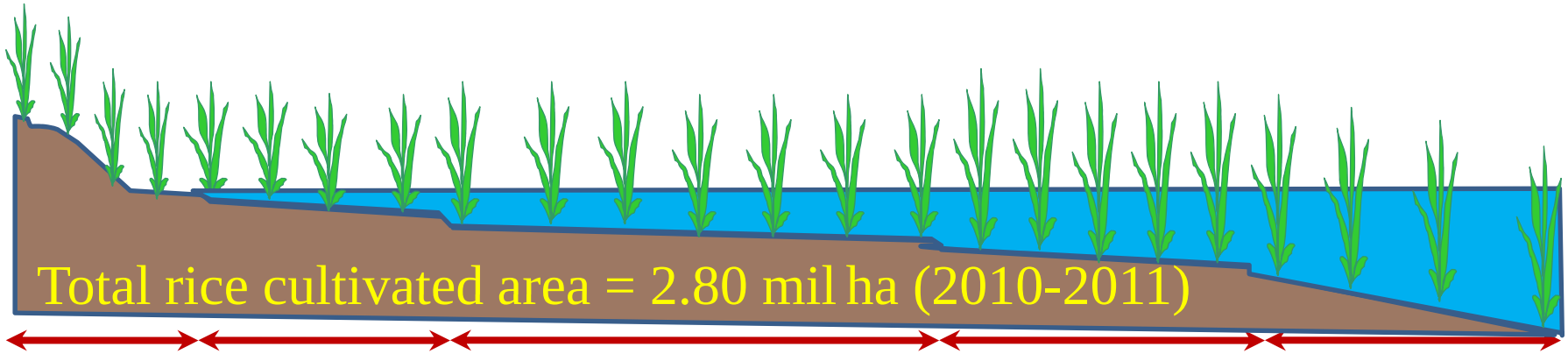
Upland: 1.9%

Deepwater/Floating: 3.4%

Dry Season: 14.5%

(Data as of 2010)

Rice Ecosystems and Proportion in 2010-2011



Upland (1.9%)

Upper field WD=0-20 cm (Early maturing =16.3%)

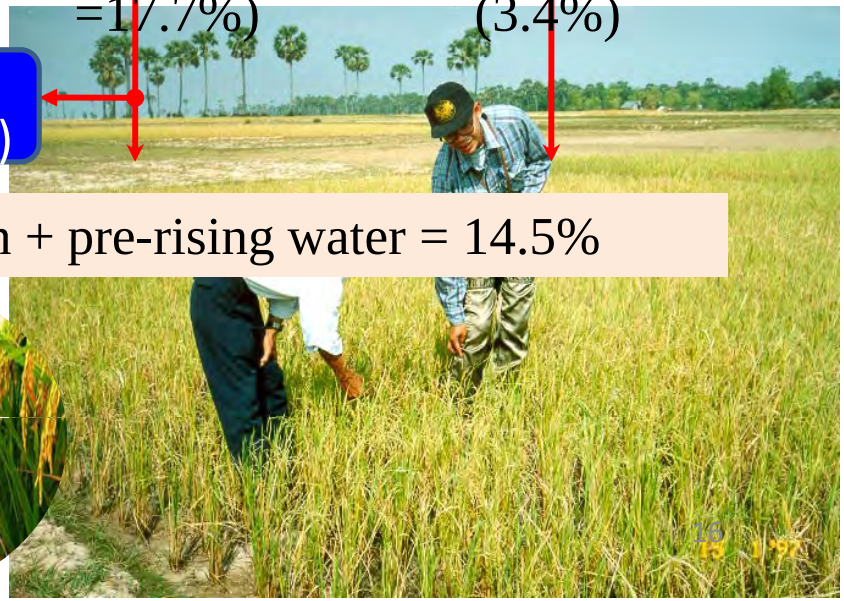
Medium field WD =0-30 cm (Intermediate maturing=42.0%)

Lower field WD=0-50 cm (Late maturing =17.7%)

Deepwater/ floating WD>50 cm (3.4%)

Early wet season (4.3%)

Dry season=fully irrigated + recession + pre-rising water = 14.5%



Relative occurrence (as percentage of total area) of the main rainfed lowland rice sub-ecosystems in Cambodia compared to neighbouring countries

Country	Shallow (0–25 cm) and prone to:				Medium To Deep	Total Area
	No water stress	Drought	Drought + submerg.	Submerg-ence	(25–50 cm)	('000 ha)
Laos	33	33	33	0	0	277
Cambodia	**10**	**29**	**57**	**0**	**5**	**747**
Thailand	9	52	24	12	3	6,039
Total	20	36	15	16	13	35,907

Source: Bell and Seng (2001)

Rice Cultivation Practices

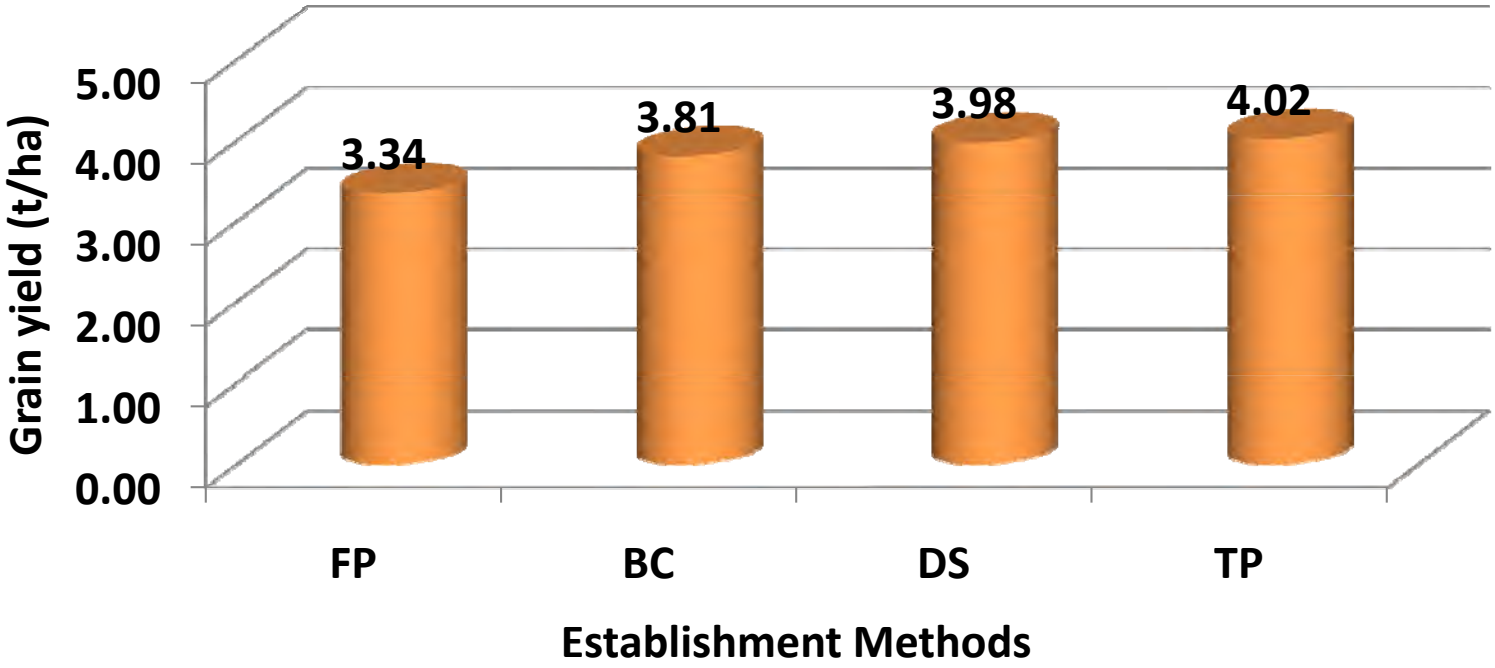
Ecosystem	Establishment practice	Notes
Rainfed lowlands	Transplanting with 2-3 seedlings/hill, 25-30 days olds , random spacing 20x20 cm. Some areas broadcast at very high rate 100-150 kg/ha. Land preparation: plowed twice, followed by harrow, generally by animals.	Tendency toward changes to more mechanization (land preparation, and harvesting). Unleveled fields are common.
Dry season/ Irrigated	Mostly broadcasting with very high seeding rate 200-250 kg/ha. Some farmers practice SRI technique in a small field (1 seedling/ hill, 10 days old, wider hill spacing).	More mechanization, Unleveled fields are less common.
Uplands	Direct seeding	Shifting toward field crops.
Deepwater	Broadcasting	Shifting toward recession rice.

Recommended rate of nutrients for rainfed lowland rice based on soil types

Soil types	Recommended rate of nutrients (kg/ha)		
	N	P	K
Prey Khmer (Psamments)	28	4	33
Prateah Lang (Plinthustalfs)	50	10	25
Bakan (Alfisol/Ultisol)	75	13	25
Koktrap (Kandic Plinthaquult)	73	15	25
Toul Samroung (Vertisol/Alfisol)	98	15	0
Krakor (Entisol/Inceptisol)	120	11	0

Source: Seng et al. (2001)

Grain yield of rice, cv. Sen Pidoa grown by various methods. Plotted values are mean of 2 sites x 3 replicates.



FP: farmer practice (BC 60 kg/ha, no weeding)
BC: broadcasting (60 kg/ha)
DS: drum seeder (60 kg/ha)
TP: transplanting (2-3 seedlings/hill, 20 days, 20x20cm)

Response of rice, cv. Phka Rumduol to NPK addition. Data are mean of 3 years x 4 replicates (CARDI 113 Project).

N timing	Total NPK (kg/ha)	Grain yield (kg/ha)	GY Increase compared to control (%)	Profit (USD/ha)
Control	0	2126	0	547
3 splits (BS, TL, PI)	183	3657	72	809
Briquette (BS)	196	3475	63	776
Delayed (15, 30, 70 ATP)	183	3365	58	735
Delayed (30, 70 ATP)	184	3523	66	778
LCC	331	3999	88	826
lsd (5%)		*268***		

Drought escape approach

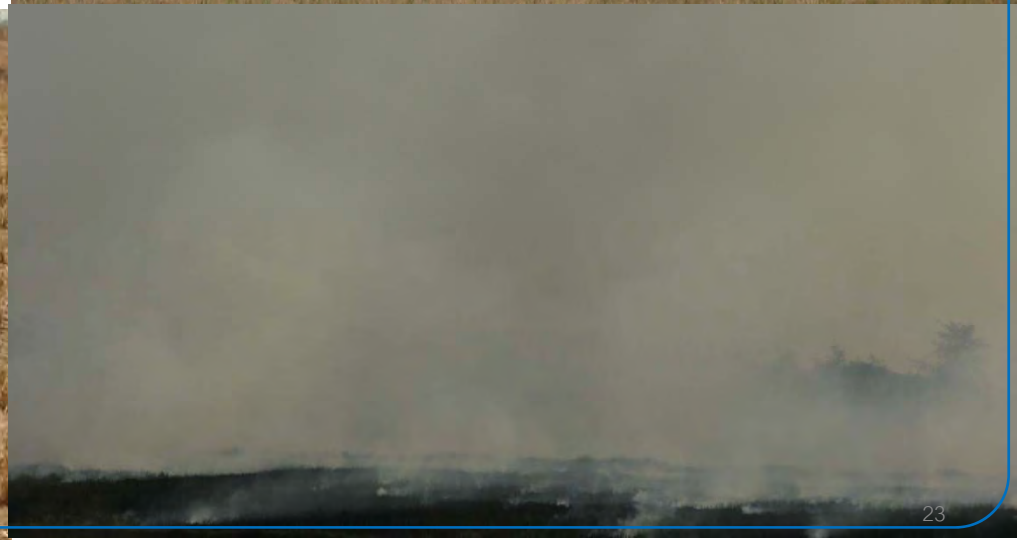
Sowing	Sowing Period	Farmer's variety	Released variety
Delay sowing	Late July-Early Aug	2.37 t/ha	3.62 t/ha
Delay in flowering		7-14 days	

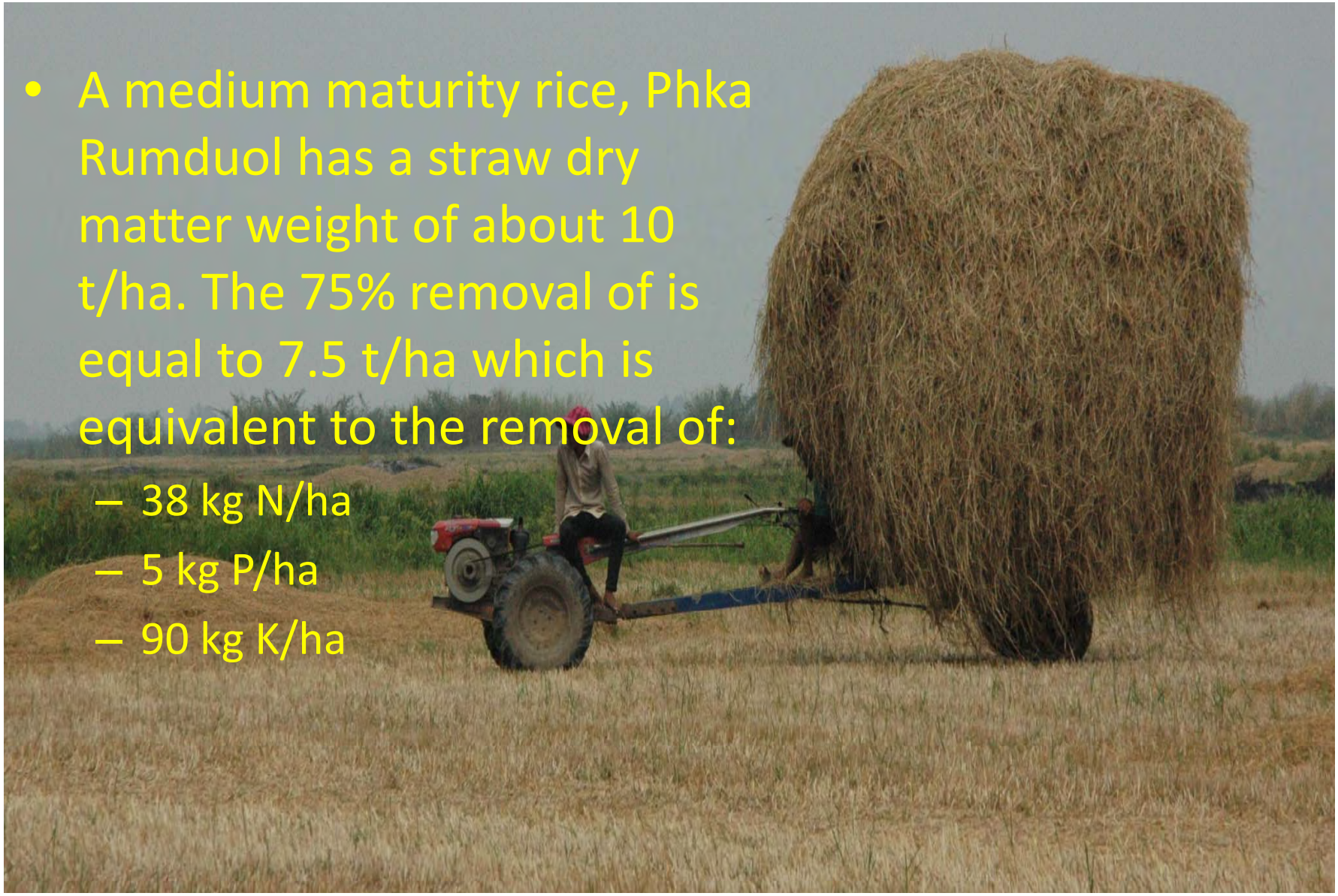
		Farmer's variety	Released var., CAR3
Mild drought tolerant	3rd week of June		
Grain yield (t/ha)		2.00	3.31
Additional gross margin		US$ 225/ha	

Management of Rice Residues

Common practices include:

- Straw removal for animal feed (60-75% of the above-ground biomass removed).
- Straw burned (Commonly in intensive dry season rice cropping).





- A medium maturity rice, Phka Rumduol has a straw dry matter weight of about 10 t/ha. The 75% removal of is equal to 7.5 t/ha which is equivalent to the removal of:
  - 38 kg N/ha
  - 5 kg P/ha
  - 90 kg K/ha

Rotation Crops

- Post-rice legumes (Mungbean, peanut)
- Rice-maize system
- Rice-water melon

Four mungbean varieties have been released:

1. **CARDI Chey**
2. **CMB01**
3. **CMB02**
4. **CMB03**

The effect of furrow irrigation frequency on grain yield and water use efficiency (WUE) of mungbean and peanut grown after WS rice (ACIAR-07 Project)

Irrigation Frequencies	Water use (mm)	Grain yield (kg/ha)	WUE (kg/ha/mm)
Mungbean			
Every 3 days	250	985	3.94
Every 6 days	216	1044	4.84
Every 9 days	177	686	3.87
Mean	*216*	*899*	*4.16*
lsd (5%)	**	168**	0.75*
Peanut			
Every 3 days	285	720	2.52
Every 6 days	244	812	3.33
Every 9 days	211	649	3.08
Mean	*249*	*749*	*3.01*
lsd (5%)	**	114*	0.48**

Soil Organic Carbon

Properties of major rice soils in the lowlands

Soil Groups (Local name)	Landscape	Area	Sand	Silt	Clay	pH	Organic C	Total N	Olsen P	Exchangeable Cations (cmol/kg)			
		(%)	(%)			(1:1 H_2O)	(g/kg)	(g/kg)	(mg/kg)	K	Na	Ca	CEC
Prateah Lang	Old colluvial/ alluvial	28	50	37	13	4.0	2.9	0.3	0.4	0.08	0.55	1.20	3.71
Krakor and Kbal Po	Active floodplain	28	18	34	48	5.9	9.1	1.0	4.6	0.24	0.62	6.68	15.1
Bakan	Old colluvial/ alluvial	13	35	49	16	5.8	6.6	0.6	1.0	0.09	0.51	1.75	4.84
Prey Khmer	Old colluvial/ alluvial	11	73	22	5	5.6	4.7	0.5	1.3	0.04	0.05	0.61	1.45
Toul Samroung	Old colluvial/ alluvial	10	28	29	42	5.5	8.8	0.9	3.1	0.17	0.29	7.10	16.0
Koktrap	Old colluvial/ alluvial	5	36	41	23	4.0	10.9	1.1	2.6	0.10	0.25	1.13	8.09

Classification of N, P, and organic C of soil samples in the Cambodian Soil Database developed by CARDI

Soil properties	Classifications[#]				
	VL	L	M	H	VH
Total N (%)	<0.05	0.05-.15	0.15-0.25	0.25-.50	>0.50
% of soils in class	63	34	3		
Olsen P (mg/kg)		0-7	7-15	>15	
% of soils in class		88	5	7	
Org C (%)	**<0.06**	**0.06-1.00**	**1.00-1.80**	**1.80-3.00**	**>3.00**
% of soils in class	**1**	**86**	**11**	**2**	

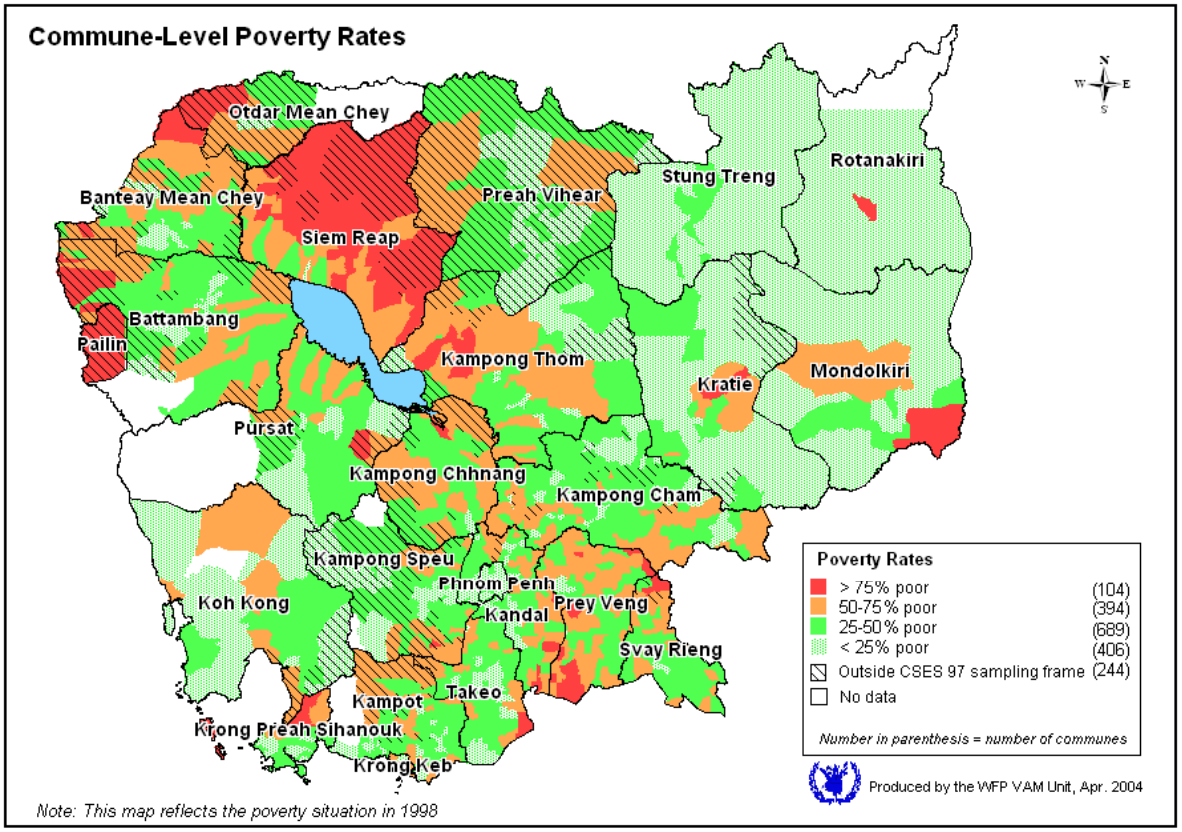
[#] VL-very low, L – low, M – medium, H – high, VH – very high

Fertilizer effect on soil organic C and other soil qualities

Time	SNMS	pH (1:5, Soil:H_2O)	Organic C (%)	Total N (%)	Olsen P (mg/kg)	Exch. K (cmol+/kg)
Before experiment	O	5.03	0.30	0.03	1.74	0.06
	I	5.08	0.31	0.03	1.47	0.10
	OI	5.00	0.25	0.03	1.34	0.16
After 6 crops	O	5.42	0.34	0.04	1.34	0.14
	I	5.72	0.37	0.03	1.48	0.17
	OI	5.67	0.34	0.03	5.39	0.19
Changes	O	0.39	0.04	0.01	-0.40	0.08
	I	0.64	0.06	0.00	0.00	0.06
	OI	0.67	0.09	0.00	4.05	0.03
Interpretation		*Strongly to moderately acidic*	*Extremely low*	*Very low*	*Very low*	*Low to very low*

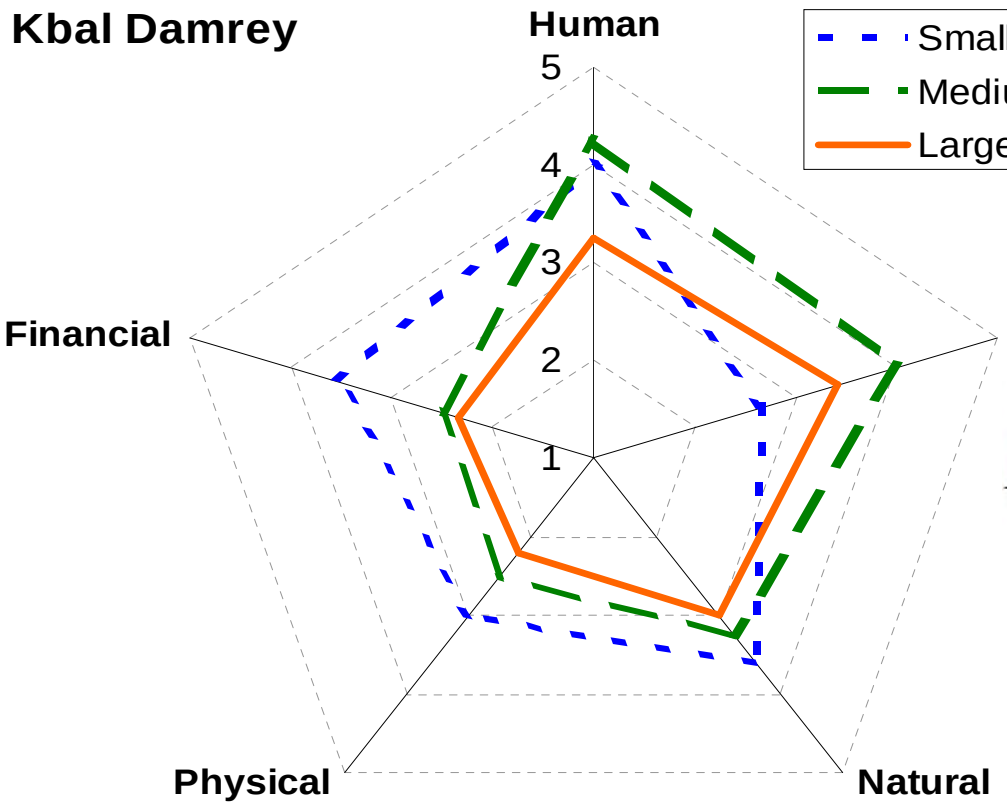
After 6 crops, soil organic C increased by 0.04-0.09%, but levels remained relatively
Seng et al. (2010).

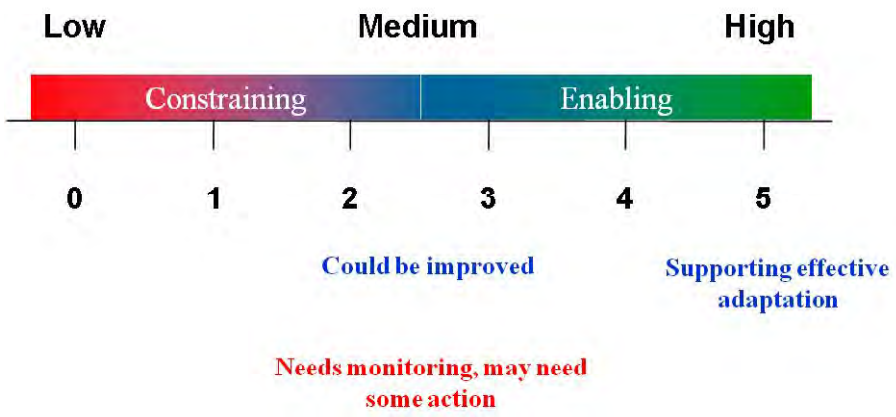
Socio-economic Status of Rice Farmer



Tendency toward shifting from subsistence-oriented to commercial oriented production with improved enabling environments:
-rice export policy,
-contract farming,
-rice mills (large scale),
-seed suppliers, and
-marketing and market information access.

Self assessment of capital assets using **SRL** framework for 3 farmer groups in Svay Rieng province (ACIAR LWR-19)





Opportunities to increase rice yields

- Science-based ‘cropcheck’ extension programs
- Focus on increasing water-use efficiency
- Breeding for drought tolerance/quick maturity
- Crop and whole-farm diversification
- Direct seeding crops before/after rice
- Adoption of land-leveling
- Supplementary irrigation
- Better management of livestock

Thank you,…