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Achieving Low Emissions Growth for Rice Cultivation in Vietnam: A Role for Behavioural Constraints

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Achieving Low Emissions Growth for Rice Cultivation in Vietnam: A Role for Behavioral Constraints

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AILEG Analysis and Investment for Low-Emission Growth



Background

- Government of Vietnam (GVN)'s Green Growth Strategy aims to reduce carbon emissions while achieving growth objectives
- Ministry of Agriculture's 20-20-20 strategy aims to reduce carbon emissions from agriculture sector by 20 percent, while reducing poverty by 20 percent and increasing agricultural gross domestic product (GDP) by 20 percent.
- Emissions from agriculture comprise 35 % of Vietnam's total carbon emissions, of which rice cultivation comprises of 50% of the share.¹

Objectives

- Estimate marginal abatement cost curves for potential mitigation options in rice:
 - The use of the short-duration rice variety;
 - Draining of rice fields or alternate wetting and drying (AWD);
 - Reduced use of nitrogen;
- Use survey data to estimate cost per hectare, yields and net revenues from the mitigation options

Data

- Red River Delta (Thai Binh Province) - 384 households; Mekong River Delta (An Giang Province) - 320 households
- Collected data on:
 - Acreage under different management systems
 - Adoption details of abatement options - rice variety, fertilizer management at various stage, water application, etc.
 - Cost of production
 - Revenue

Cost of Abatement Options Net Incremental Cost Under Different Mitigation Options ('000VND/ha)

Mitigation Options	South		North	
	Spring 2012	Fall 2012	Winter 2012	Spring 2012
Low Fertilizer	1,565	932	-1,725	-2,938
Short-Duration Variety	387	342	-1,198	-2,533
AWD	15,534	8,116	15,804	9,867

Results: Cost of Abatement Options

- AWD implies a higher net cost for farmers because of higher direct costs that do not make up any potential yield increases
- Low fertilizer and short duration variety has a lower cost in the North, but not so in the South. They are not clear abatement options implying that further assessment of costs is needed before promoting it as an abatement option

Adoption of Mitigation Options Percent Households Adopting Mitigation Options

Mitigation Options	South		North	
	Spring 2012	Fall 2012	Winter 2012	Spring 2012
No Mitigation Options	16%	17%	3%	2%
Low Fertilizer (Nitrogen application less than 120kg/ha)	13%	17%	33%	36%
Short-duration variety	59%	61%	77%	90%
AWD	24%	36%	1%	1%
Low Fertilizer, AWD	3%	5%	0%	1%
Organic Amendments	0%	1%	20%	20%
Low Fertilizer, Short-Duration	8%	9%	28%	34%
Short-Duration, AWD	8%	19%	1%	1%
Low Fertilizer, Short-Duration, AWD	1%	1%	0%	1%

Results: Adoption of Mitigation Options

- Very low adoption of AWD
- Farmers who say they adopted AWD do not practice water management as required by AWD reflecting the difficulty in adopting AWD and constraints that farmers face in adopting it - there are behavioral constraints in changing water use for rice
- Significant adoption of short duration variety - suggesting GVN can focus on other abatement options
- Low fertilizer option is adopted by roughly one-third of the farmers

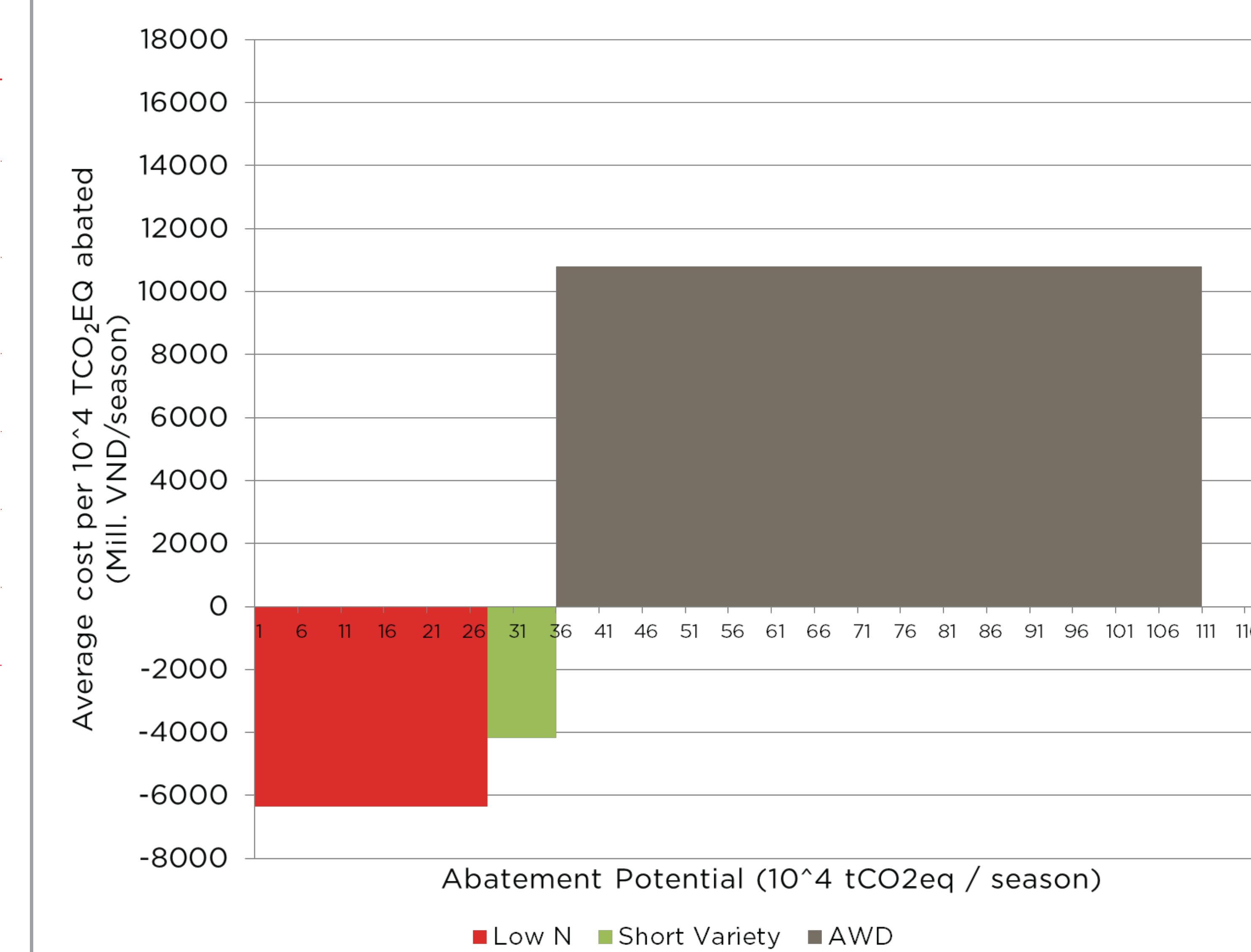
Emissions by Abatement Options Average Emissions for Rice Sector by Mitigation Option (TCO₂E/season/HA)

Mitigation Options	South		North	
	Spring 2012	Fall 2012	Winter 2012	Spring 2012
Average Emissions in 2012	12	11	9	9
AWD	6.9	6.0	5.1	6.9
Low Fertilizer	10.8	17.0	8.4	11.4
Short Duration Variety	17.7	15.9	9.8	9.9
No Mitigation	13.5	13.6	13.9	16.0

Source: DNDC Modeling by Salas, Trinh et al (2013)

- Among the abatement options considered, AWD has lowest carbon emissions per hectare
- In the South, short duration variety does not lead to lower emissions!

Marginal Abatement Cost Curve (Spring)



Results: Marginal Abatement Cost Curve (Spring)

- Short duration variety not an abatement option in the South, has low potential in the North.
- Increasing adoption of low nitrogen is a low hanging fruit in the North because it also implies lower costs for farmers.
- AWD has highest potential both in terms of having highest reduction in carbon emissions per hectare, and the total potential acreage, given low adoption by farmers.
- The result contradicts what engineering based studies imply about AWD.^{2,3}

Conclusions

- In rice cultivation, evidence from Vietnam suggests that AWD, or management of water use leads to significant reduction on carbon emissions. However, the technology is complex and farmers face constraints in adopting it - fewer farmers know about it, and those who know do not practice it accurately. Field data suggests that in fact farmers who use AWD experience higher costs of production.
- Behavior change efforts will have to focus on communicating how farmers can follow the requirements for AWD and understanding why farmers face higher costs on the field.
- Given the differences in costs between engineering estimates and field data, more research is needed in how engineering cost estimates translate on the field.
- The results explain why Vietnam has seen low adoption of AWD despite GVN's efforts to promote it.



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