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Impacts of Climate Change, Adaptation and Mitigation Strategies in China's Agricultural Sector

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Impacts of Climate Change, Adaptation and Mitigation Strategies in China's Agricultural Sector



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Questions

- Develop one integrated conceptual framework and analysis tool that can be used to analyze the relationship among climate change, water and agricultural production.
- Explore the impacts of climate change on water availability and irrigation water demand.
- Explore the impacts of climate change on agricultural production and cropping pattern.
- Provide several policy recommendations in water and agricultural development.

Views from Natural Scientists

Impacts of Climate Change on Crop Yields (A2 Scenarios)

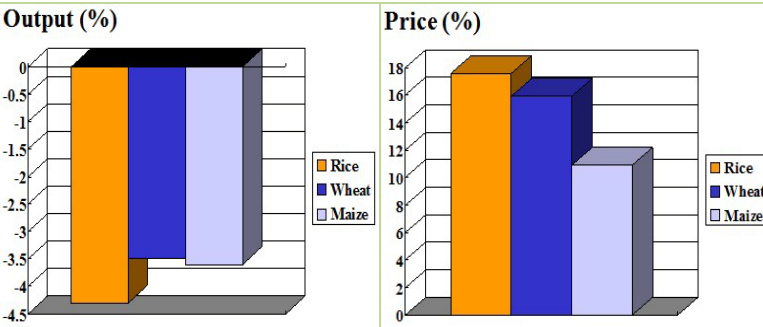
Scenarios	Rice		Maize		Wheat		
	Rain-fed	Irrigated	Rain-fed	Irrigated	Rain-fed	Irrigated	
With CO2 fertilization	2020s	2.1	3.2	9.8	-0.6	15.4	13.3
	2050s	3.4	6.2	18.4	-2.2	20	25.1
	2080s	4.3	7.8	20.3	-2.8	23.6	40.3
No CO2 fertilization	2020s	-12.9	-8.9	-10.3	-5.3	-18.5	-5.6
	2050s	-13.6	-12.4	-22.8	-11.9	-20.4	-6.7
	2080s	-28.6	-16.8	-36.4	-14.4	-21.7	-8.9

Sources: Xiong, et al., 2008.

- Impacts are significant and become more amplifies over time
- Impacts vary by assumptions on CO2 fertilization and by crops

Views from Economics

Impacts of climate change on grain production and price under A2 scenario in China by 2030 (Percentage change compared with baseline)

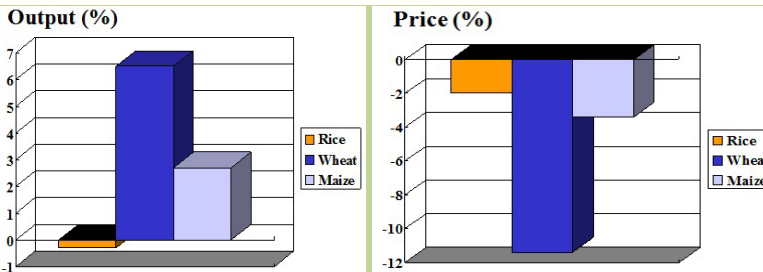


After considered market response, impacts could largely be reduced

Without considering CO2 fertilization

Views from Economics

Impacts of climate change on grain production and price under A2 scenario in China by 2030 (Percentage change compared with baseline)



After considered market response, impacts could largely be reduced

Considering CO2 fertilization, the negative impacts will be much smaller

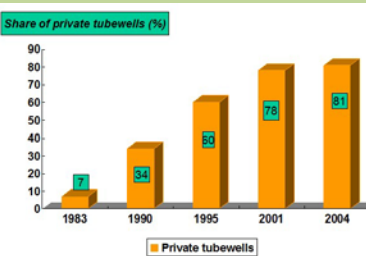
Adaptive Responses by Governments

- Highlighted by China's National Climate Change Program:
 - Improve agricultural infrastructure
 - Strengthen research and development for new technologies
- Progress on Implementation of Government Adaptation Strategies:
 - Increase the political profile of and public investment in climate change research
 - Increase experimentation with different types of insurance policies

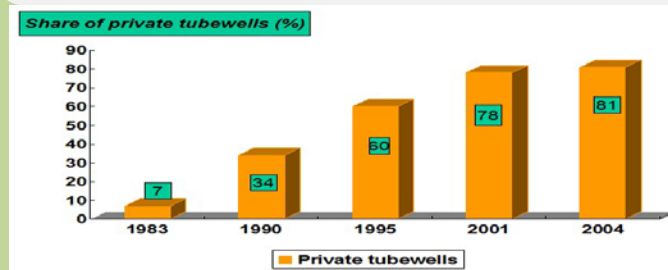
Famers' Response by Changing Crop Choice: Annual Marginal Effect of Climate Change on Crop Choice in China

	Temperature	Precipitation
Wheat	+	-
Maize	+	-
Rice	-	+
Cotton	+	+
Oil	+	+
Potato	-	-
Soybean	-	+
Sugar	-	+
Vegetable	-	+

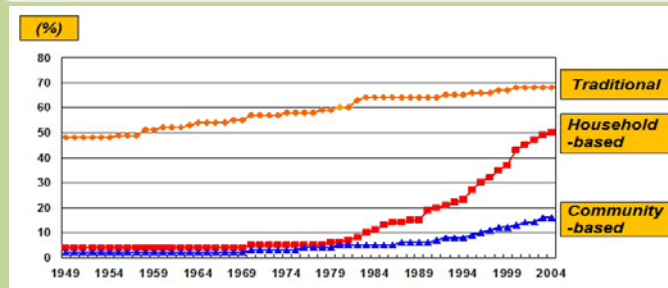
Famers' Response by Changing Crop Choice: Development of Private Tubewells in Hebei and Henan Provinces



Farmers' Response by Increasing Irrigation Investment: Development of Private Tubewells in Hebei and Henan provinces



Farmers' Response by Adopting Water Saving Technologies: Share of Villages Adopting Water Saving Technologies in Northern China



Agricultural Sector Greenhouse Gas Emissions from agricultural Sector in Selected Countries (percentage of total emissions)

	1995	2005
Australia	21.8	19.7
Brazil	58.5	58.4
China	21.8	15.4
European Union	10.5	10
India	25.7	21.6
New Zealand	54.1	48.1
United States	6.8	6.4
World	17	16.1

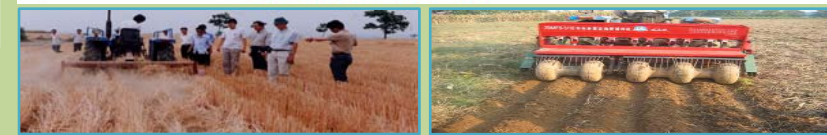
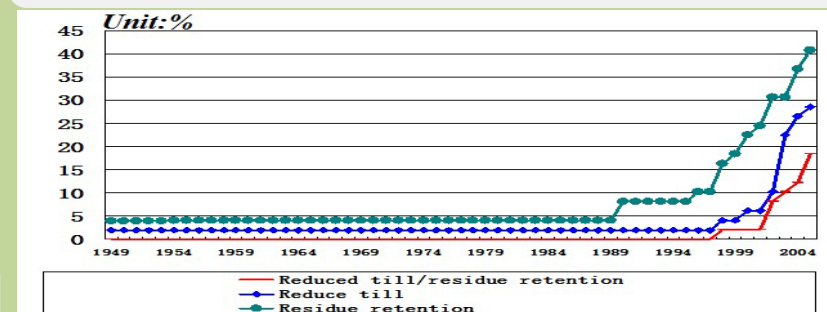
Source: CAIT v 7.0, World Resources Institute 2010.

Impact of Technology on N-fertilizer use quantities in rice production in China.

	The quantity of N-fertilizer use			
	Linear model		Log model	
	Coefficient	T value	Coefficient	T value
Technology training course	13.345	-0.84	0.147	1.55
A1 plot	-52.378	(3.45)***	-0.35	3.86***
A2 plot	-10.88	-0.72	-0.096	1.05
B1 plot	-38.277	(2.66)***	-0.27	3.11***
B2 plot	-11.384	-0.79	-0.106	1.23
C plot	-22.652	-1.53	-0.18	2.04**
House	-2.501	-0.63	-0.01	0.41

- There is a great room to reduce N-fertilizer use in China
- 18% -- training farmers only
 - 27% -- training + field advice from technician
 - 35% -- training + strict use of recommended tech
- No lost of crop yield

Share of Villages Adopting Conservation Tillage Technologies (1949-2005)



Concluding Remarks

- On adaptation and mitigation, while large number of options have been documented, much more efforts should be made on (5Is):
- innovated ways to foster resiliency and reduce vulnerability in agriculture
 - innovated technologies that could be adopted by farmers to adapted to climate change
 - institutions for adaptation and mitigation
 - incentive for adaptation and mitigation
 - investment in agriculture
 - ...