Climate Change, Food Availability, and Poverty: The Case of Philippine Rice

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Philippine Rice Policy

- National Food Authority (NFA)
  - Mission:
    - "Ensure reasonable rate of return to Filipino farmers, provide adequate supply and *affordable rice* and corn for the country…"
  - Goal: "DA targets rice self-sufficiency by 2020, intensifies the promotion of hybridization of rice"
  - Key programs:
    - Procure palay from farmers at support price – Php 17/kg
      - (2012-2016 average NFA procurement 1.2 % of palay production)
    - Release price (regular-milled) – Php 27/kg
  - The Philippines is the only country in WTO with rice QR
    - 1995 to 2005
    - 2006 to June 2012
    - 2013 to June 2017
  - Next month, March 5, 2019, to introduce a policy reform in rice: replacing QR with tariffs

Objectives

Analyze the impact of climate change on rice production particular in unirrigated areas with respect to the following variables

Prices, consumption, household income, poverty, and income distribution

Look into possible policy changes that can minimize the negative impact on households

Table 1. *Food Consumption in the Philippines*

	Poor					Non-poor				
	1997	2000	2003	2009	2012	1997	2000	2003	2009	2012
	Philippines /a/									
Total Food /b/	64.6	63.3	62.6	52.0	60.99	49.9	48.1	47.7	43.0	45.6
Cereals /c/	30.2	27.9	27.0	25.7	25.6	15.3	13.5	12.8	13.1	12.2
Rice /d/				22.5	19				11.3	9
	Rural									
Total Food	64.9	64.2		51.0	57.78	53.2	52.0		43.1	46
Cereals	30.9	29.6		25.9	22.1	19.0	17.2		15.2	10.8
Rice				22.7	16				14.1	7
	Urban									
Total Food	63.3	61.1		56.1	61.8	47.5	45.4		42.9	45.1
Cereals	27.7	23.6		24.9	26.5	12.5	10.9		11.2	13.8
Rice				21.8	20				8.7	10

Sources: Philippine Statistical Authority (1997, 2000, 2003, 2009 2012).
/a/ No rural and urban breakdown in 2003 FIES
/b/ Percent of total consumption
/c/ Includes rice and corn
/d/ Cereals were disaggregated into rice, corn, and other cereals in 2009 and 2012 FIES

Table 2. *Rice a Major Crop in the Philippines*

	2012			2013			2014			2015		
	Area /a/	Quantity/b/	Value /c/	Area	Quantity	Value	Area	Quantity	Value	Area	Quantity	Value
Palay	35.1	20.5	36.6	35.6	21.5	38.6	35.5	21.8	33.9	35.2	21.5	36.3
Corn	19.4	8.4	11.8	19.2	8.6	11.1	19.6	8.9	9.7	19.4	8.9	10.8
Coconut	26.8	18.0	11.1	26.6	17.9	10.1	26.2	16.9	11.3	26.6	17.5	11.1
Sugarcane	3.2	30.0	5.3	3.3	28.7	4.9	3.2	28.8	4.5	3.2	27.2	5.0
Other crops	15.4	23.1	35.1	15.3	23.3	35.3	15.5	23.6	40.6	15.7	24.9	36.8
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Philippine Statistical Authority (2016).
/a/ Share of total agricultural land.
/b/ Share of total quantity (thousand metric tons) of agricultural commodities
/c/ Share of total value of agricultural production

Irrigation and Rain-Fed Palay Production

		(2)			Yield (3)		
	(1)	Irrigated	Rain-fed	Total	Irrigated	Rain-fed	% diff. (4)
Overall Philippines	100.0	75.8	24.2	100.0	4.30	3.02	42.6
Region 1 - Ilocos Region	9.8	72.4	27.6	100.0	4.55	3.84	18.4
Region 2 - Cagayan Valley	13.4	91.9	8.1	100.0	4.43	2.62	69.0
Region 3 - Central Luzon	18.8	91.7	8.3	100.0	4.99	3.74	33.3
Region 4a - CALABARZON /a/	2.2	80.4	19.6	100.0	3.86	2.51	54.0
Region 4b - MINAROPA/b/	5.9	71.6	28.4	100.0	3.96	3.30	19.8
Region 5 - Bicol Region	6.9	71.0	29.0	100.0	3.94	3.09	27.6
Region 6 - Western Visayas	11.0	51.5	48.5	100.0	3.68	3.02	21.9
Region 7- Central Visayas	1.7	64.4	35.6	100.0	3.56	2.63	35.5
Region 8 - Eastern Visayas	5.4	56.7	43.3	100.0	4.29	2.84	51.0
Region 9 - Zamboanga Peninsula	3.5	64.7	35.3	100.0	4.38	3.32	32.0
Region 10 - Northern Mindanao	3.8	90.4	9.6	100.0	4.48	3.33	34.6
Region 11 - Davao Region	2.4	90.9	9.1	100.0	4.48	3.03	47.9
Region 12 - SOCCKSKSARGEN /c/	7.1	82.1	17.9	100.0	4.05	2.99	35.3
Region 13 - CARAGA /d/	2.8	63.3	36.7	100.0	3.44	2.77	24.0
Region 14 - Auto. Region Muslin Mind	3.0	30.8	69.2	100.0	3.35	2.37	41.8
Region 15 - Cordillera Admin. Region	2.4	86.1	13.9	100.0	4.05	2.40	68.9

Economic Models Used

- 19-sector Philippine CGE model calibrated using 2015 SAM
- Rice quota incorporated as constraint;
- Land-use
- CGE results utilized in poverty microsimulation
- Poverty microsimulation
  - Employment/unemployment – bootstrapping, process repeated 30 times
  - Uses 2012 FIES
  - Computes FGT poverty indices (P0, P1, P2) and GINI coefficient

Simulations

SIM 1: This scenario involves a reduction in rice productivity as a result of climate change. A 4.5% reduction is followed with the reduction rounded off to a reduction of 5%. The decline in palay productivity is introduced by reducing the scale parameter of the production of palay by 5%, which is expected to decrease the local production of palay and rice, as well as to increase their prices.

SIM 2: SIM 1 + A reduction in the trade barriers on rice imports by cutting in half both the in-quota tariff rate on rice (originally at 35%) and the out-quota tariff rate (originally at 40%).

Impact of Climate Change on Rice Yield in the Philippines

	Irrigated			Rain-fed		
	Low /a/	High /b/	Average	Low	High	Average
Luzon	-0.20	-0.10	-0.15	-7.40	-7.70	-7.55
Visayas	-1.10	-0.60	-0.85	-4.10	-3.90	-4.00
Mindanao	-0.80	0.70	-0.05	-0.50	-0.60	-0.55
Philippines	-0.40	0.00	-0.20	-4.50	-4.50	-4.50
Source: Thomas, Pradesha, and Perez (2015)						
/a/ Low - with current low fertilizer use						
/b/ High - with current high fertilizer use						

Climate Change effects on palay and rice, (% change from base)

	Volume	Prices
Production		
Palay	-1.081	5.254
Rice	-1.228	2.307
Consumption		
Palay	-1.074	5.231
Rice	-0.456	2.033

Climate Change effects on household income and prices,

(% change from base)

	Nominal Income	Prices	Real Income
h1	-0.059	0.348	-0.407
h2	-0.055	0.334	-0.389
h3	-0.052	0.293	-0.345
h4	-0.048	0.248	-0.296
h5	-0.041	0.200	-0.241
h6	-0.038	0.162	-0.199
h7	-0.033	0.128	-0.162
h8	-0.031	0.092	-0.124
h9	-0.031	0.056	-0.087
h10	-0.020	0.009	-0.030

Climate Change effects on poverty and income distribution

		Base 2012	SIM	
		Level	Level	% change from base
GINI Coefficient		0.47126	0.47149	0.049
Philippines	P0	24.848	24.927	0.316
	P1	6.836	6.870	0.490
	P2	2.679	2.695	0.620
Urban	P0	11.570	11.664	0.813
	P1	2.794	2.814	0.732
	P2	0.989	0.999	0.936
Rural	P0	35.584	35.650	0.186
	P1	10.105	10.149	0.436
	P2	4.044	4.067	0.557
P0 - poverty incidence				
P1- poverty gap				
P2- poverty severity				

Climate Change and Reduction (50%) in Rice Trade Controls: Effects on Rice and Palay

	Volume	Prices
Production		
Palay	-3.588	3.990
Rice	-4.265	-1.580
Consumption		
Palay	-3.583	3.979
Rice	0.713	-3.201
Imports		
Rice	42.473	-14.290

Climate Change and Reduction (50%) in Rice Trade Controls: Effects on Income

	Nominal Income	Prices	Real Income
h1	-0.430	-0.726	0.296
h2	-0.425	-0.686	0.262
h3	-0.424	-0.623	0.199
h4	-0.422	-0.558	0.137
h5	-0.418	-0.490	0.072
h6	-0.414	-0.441	0.026
h7	-0.409	-0.397	-0.012
h8	-0.405	-0.356	-0.049
h9	-0.397	-0.320	-0.076
h10	-0.504	-0.262	-0.242

Climate Change and Reduction (50%) in Rice Trade Controls: Effects on Poverty

POVERTY MICROSIMULATION (SIM 2)

		Base 2012	SIM	
		Level	Level	% change from base
GINI Coefficient		0.47126	0.47054	-0.151
Philippines	P0	24.848	24.772	-0.308
	P1	6.836	6.794	-0.615
	P2	2.679	2.657	-0.810
Urban	P0	11.570	11.542	-0.243
	P1	2.794	2.777	-0.593
	P2	0.989	0.982	-0.787
Rural	P0	35.584	35.468	-0.325
	P1	10.105	10.042	-0.620
	P2	4.044	4.012	-0.815
P0 - poverty incidence				
P1- poverty gap				
P2- poverty severity				

Insights

The simulation results indicate that climate change tightens the supply of rice in the domestic market due to the reduction in palay production.

This reduction in the supply of rice negatively affects the Philippine economy and worsens poverty as well as income inequality.

Insights

Trade reforms in rice can be used to minimize the negative impact of climate change on palay production, rice supply and prices, household income, and poverty.

The simulation results indicate that reducing both the in-quota and out-quota tariff rates will not only relax the supply constraints in rice supply, it will also lead to overall welfare improvement, higher real income for poor households, and lower poverty and income inequality.

Thank you very much!