

***MEASURING CUBA'S
AGRICULTURAL
TRANSFORMATIONS: PRELIMINARY
FINDINGS***



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OUTLINE

- I. INSTITUTIONAL FRAMEWORK
- II. METRICS, EXPECTED OUTCOMES & STATISTICAL ISSUES
- III. PRELIMINARY FINDINGS
- IV. CONCLUSIONS

I. Institutional Framework

- *Derec Law 259 (2008)* – Centerpiece of Cuba’s agricultural transformations since 2008
- **Cuba’s Renewed Agricultural Model:**
 1. Increased self-sufficiency in food production
 2. Promotion of food processing and other value-added activities
 3. Export promotion (to increase hard currency receipts)
 4. Decentralized management: Emphasis on mercantile/monetary relationships
 5. Decentralized marketing and procurement of agricultural goods
 6. Centralized price determination, except for selected products
 7. Greater autonomy for non-state agricultural producers (Cooperatives AND Private farmers)
 8. Improved access to agricultural inputs
 9. Gradual/selective introduction of market-based “coordination mechanisms”
 10. More flexible tax treatment for Non-State agricultural producers
 11. Specialized/calibrated financing strategy:
 - Reduction/elimination of state subsidies
 - Expansion of microfinance

II. METRICS, EXPECTED OUTCOMES & STATISTICAL ISSUES

BASIC STANDARD METRICS (Cited in the literature on agricultural transition):

- Labor productivity (APL = TP/L) : Output/Input ratio measures efficiency
 - GDP and agricultural product (output)
 - Agricultural yields
- **Expected Outcomes/Results: As non-State actors increase their share of agricultural output**
 - Initial decreases in output, as agriculture migrates from capital-intensive, State-subsidized, collectivist model (5 years)
 - Second state: GDP growth (recovery) drives increases in agricultural product (output)
 - Higher yields, as output shrinks, but area under cultivation increases.
 - Changes in the productivity of labor

METRICS Used in this Paper:

1. **Output and area under cultivation**
2. **Crop yields**

SOME STATISTICAL ISSUES:

- Employment statistics do not reflect some 71,000 (plus) new landholders after the approval of Decree-Law 259 (2008).
- Differences in output data presented in the Annual Statistical Yearbook (*Anuario Estadístico de Cuba*) and the Quarterly Reports published by the National Statistics Office (*Oficina Nacional de Estadísticas – ONE*)
- In the case of Cuba, ONE agricultural employment statistics are not broken down. (It is hard to determine the amount of labor allocated to each major non-sugar crop category).

III. PRELIMINARY FINDINGS

TABLE 1. AGRICULTURAL PRODUCTION, AREAS UNDER CULTIVATION, AND EMPLOYMENT, 2005 - 2010

<i>VIANDAS</i>				<i>RICE</i>			
Year	Output (Tons)	Area Under Cultivation (Hectares)	Employment (thousands)	Year	Output (Tons)	Area Under Cultivation (Hectares)	Employment (thousands)
2005	2,575,300	347,039	956.3	2005	367,600	127,197	956.3
2006	2,020,000	283,093	951.9	2006	434,200	142,829	951.9
2007	2,360,500	306,407	912.3	2007	439,600	136,099	912.3
2008	2,150,700	279,752	919.1	2008	436,000	155,514	919.1
2009	2,236,000	352,452	945.6	2009	533,600	215,751	945.6
2010	2,250,000	363,036	921.5	2010	454,400	176,423	921.5
% chg.	-12.6%	4.6%	-3.6%	% chg.	23.6%	38.7%	-3.6%
<i>PLANTAINS</i>				<i>BEANS</i>			
Year	Output (Tons)	Area Under Cultivation (Hectares)	Employment (thousands)	Year	Output (Tons)	Area Under Cultivation (Hectares)	Employment (thousands)
2005	773,500	95,931	956.3	2005	106,200	94,821	956.3
2006	871,800	283,093	951.9	2006	70,600	76,740	951.9
2007	990,900	306,407	912.3	2007	97,200	83,793	912.3
2008	758,200	279,752	919.1	2008	97,200	95,306	919.1
2009	670,400	352,452	945.6	2009	110,800	150,584	945.6
2010	735,000	363,036	921.5	2010	80,400	112,702	921.5
% chg.	-5.0%	278.4%	-3.6%	% chg.	-24.3%	18.9%	-3.6%
<i>VEGETABLES</i>				<i>CITRIC FRUITS</i>			
Year	Output (Tons)	Area Under Cultivation (Hectares)	Employment (thousands)	Year	Output (Tons)	Area Under Cultivation (Hectares)	Employment (thousands)
2005	3,203,500	311,732	956.3	2005	554,600	56,248	956.3
2006	2,672,100	231,716	951.9	2006	373,000	55,423	951.9
2007	2,603,000	230,763	912.3	2007	469,000	48,854	912.3
2008	2,439,300	259,073	919.1	2008	391,800	45,635	919.1
2009	2,548,800	278,561	945.6	2009	418,000	47,921	945.6
2010	2,141,000	236,568	921.5	2010	345,000	43,149	921.5
% chg.	-33.2%	-24.1%	-3.6%	% chg.	-37.8%	-23.3%	-3.6%

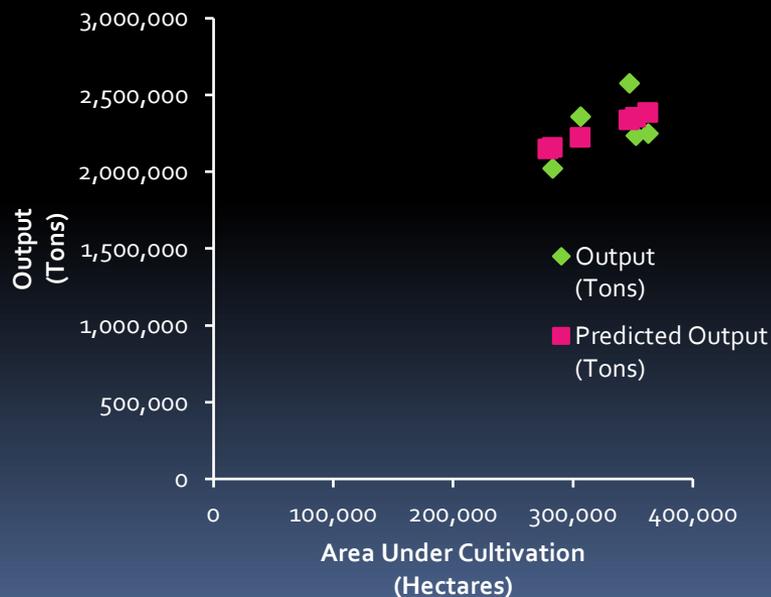
III. PRELIMINARY FINDINGS: Regression

TABLE 2. SELECTED REGRESSION OUTPUT SUMMARY

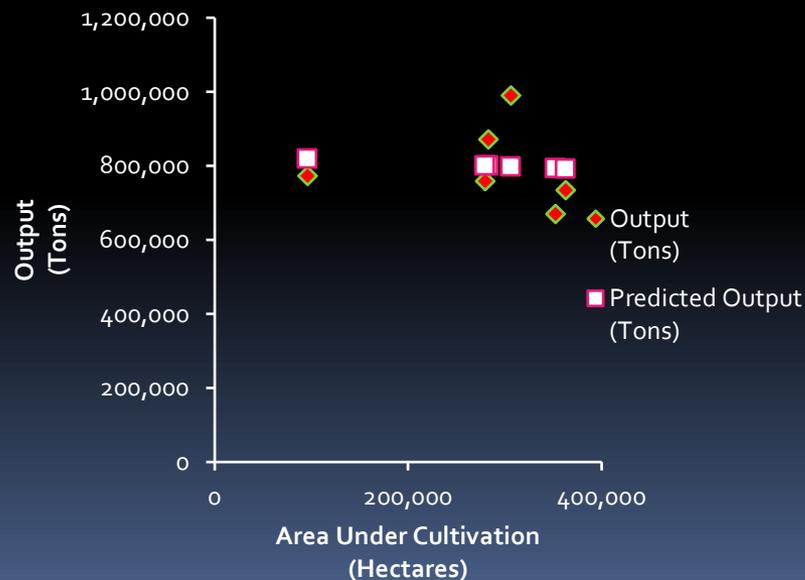
Regression analysis: *Is area under cultivation a predictor of output?*

CROP	R Square	Adj. R Square	Coefficients	Standard Error	P-value	Lower 95%	Upper 95%	Statistically Significant? (5% level)
Viandas	0.301	0.126	2.823	2.151	0.260	-3.149	8.796	NO
Plantains	0.007	-0.241	-0.099	0.588	0.874	-1.731	1.533	NO
Vegetables	0.482	0.352	7.508	3.892	0.126	-3.299	18.314	NO
Rice	0.844	0.805	1.497	0.321	0.010	0.604	2.389	YES
Beans	0.286	0.108	0.309	0.244	0.274	-0.369	0.988	NO
Citrus Fruits	0.349	0.187	8.542	5.829	0.217	-7.641	24.725	NO

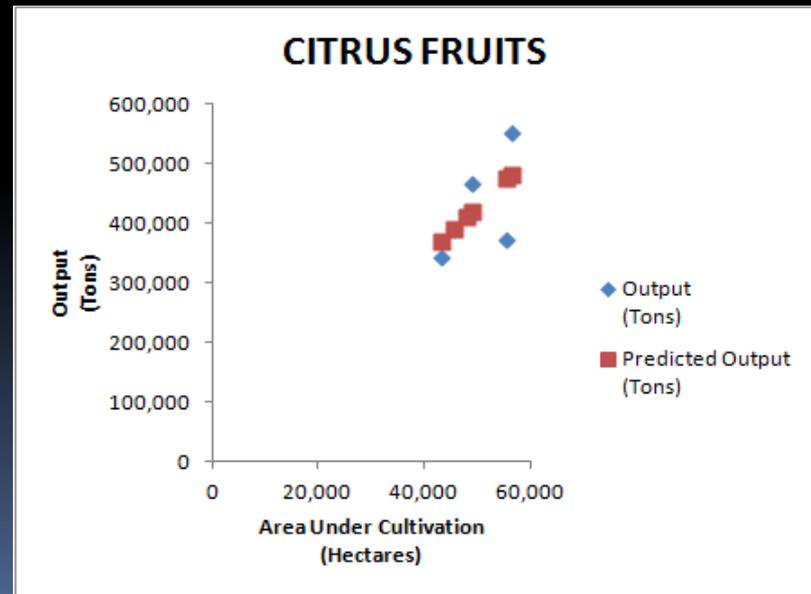
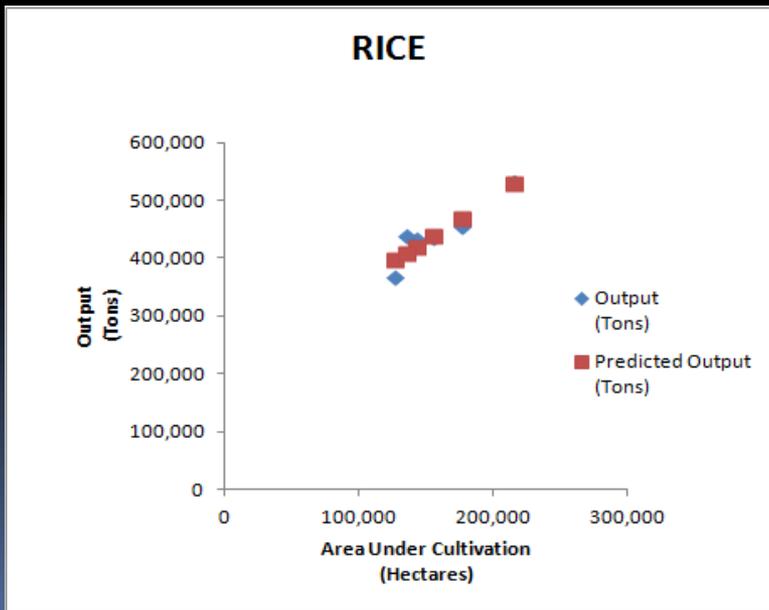
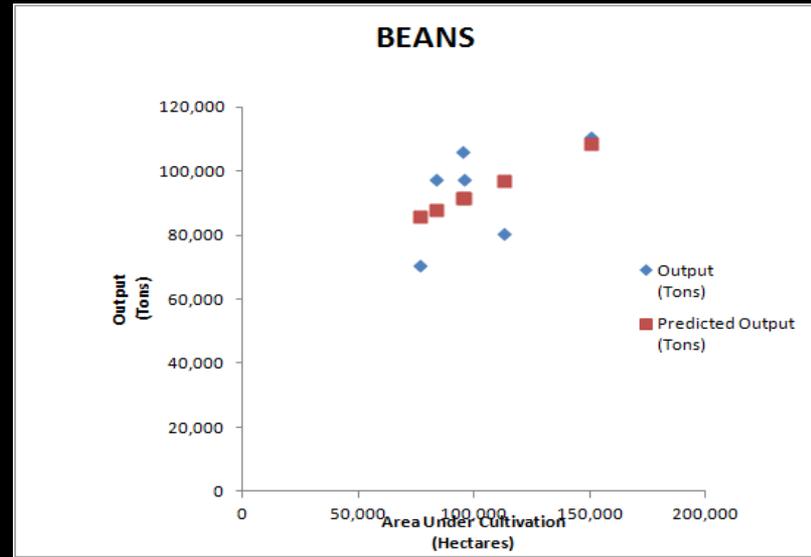
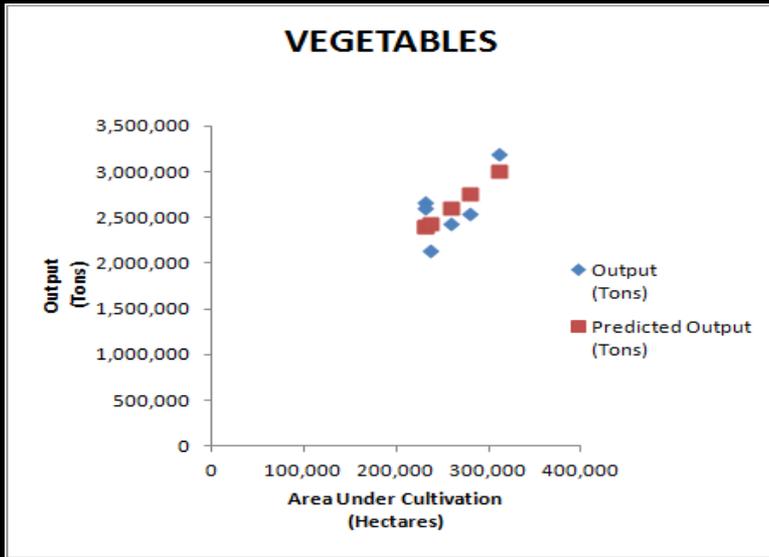
VIANDAS



PLANTAINS



III. PRELIMINARY FINDINGS: Regression Results



III. PRELIMINARY FINDINGS: Crop Yields

Table 3. Yield of selected crops other than sugarcane

Crop	2005	2006	2007	2008	2009	2010	Percentage Change 2008- 2010
Viandas ^(a)	7.42	7.78	7.73	7.69	6.34	6.20	-19.4%
Plantains	8.11	8.71	9.67	9.07	6.30	6.17	-32.0%
Vegetables	10.28	11.53	11.28	9.42	9.15	9.05	-3.9%
Cereals	2.58	2.79	2.91	2.68	2.07	1.94	-27.5%
Rice	2.89	3.04	3.23	2.80	2.61	2.58	-8.1%
Legumes	1.12	0.92	1.16	1.02	0.74	0.71	-30.1%
Beans	1.12	0.92	1.16	1.02	0.74	0.71	-30.1%
Tobacco	1.28	1.10	1.12	0.93	1.01	1.01	8.5%
Citric Fruits	9.86	6.73	9.60	8.59	8.72	8.00	-6.9%
Other Fruits	10.11	9.71	7.84	8.89	8.16	7.86	-11.5%
Cocoa	0.51	0.53	0.50	0.29	0.27	0.32	11.1%

- Yields normally fall as land under cultivation increases, but output decreases.
- In the case of Cuba, yields have declined significantly since 2008.

III. PRELIMINARY FINDINGS: Crop Yields

Table 4. Yield of selected crops other than sugarcane. State sector

Crop	2005	2006	2007	2008	2009	2010	Percentage Change 2008 - 2010
Viandas ^(a)	8.45	10.17	8.76	8.30	9.29	8.42	1.5%
Plantains	10.58	11.58	10.10	9.07	8.69	8.85	-2.5%
Vegetables	16.30	16.02	16.55	12.71	15.53	14.69	15.6%
Cereals	2.59	3.09	2.80	2.54	2.92	2.38	-6.3%
Rice	3.11	3.64	3.06	2.94	2.98	2.70	-8.1%
Legumes	1.59	0.80	0.73	0.60	1.09	0.57	-6.3%
Beans	1.59	0.80	0.73	0.60	1.09	0.57	-6.3%
Tobacco	2.24	1.10	1.12	0.81	0.46	0.77	-5.0%
Citric Fruits	12.96	9.62	11.77	11.60	14.11	12.36	6.6%
Other Fruits	8.73	6.84	5.44	4.82	6.34	3.78	-21.6%
Cocoa	0.29	0.29	0.29	0.20	0.16	0.14	-30.6%

Table 5. Yield of selected crops other than sugarcane. Private sector

Crop	2005	2006	2007	2008	2009	2010	Percentage Change 2008 - 2010
Viandas ^(a)	7.26	7.42	7.59	7.59	6.02	5.99	-21.1%
Plantains	7.62	8.19	9.59	9.06	6.00	5.89	-35.0%
Vegetables	9.41	10.75	10.49	8.91	8.32	8.32	-6.7%
Cereals	2.58	2.76	2.92	2.69	1.99	1.91	-29.1%
Rice	2.86	2.98	3.25	2.79	2.56	2.56	-8.1%
Legumes	1.08	0.93	1.18	1.04	0.72	0.72	-30.7%
Beans	1.08	0.93	1.18	1.04	0.72	0.72	-30.7%
Tobacco	1.27	1.10	1.12	0.93	1.03	1.02	8.7%
Citric Fruits	7.84	4.85	7.84	6.02	5.44	5.44	-9.6%
Other Fruits	10.30	10.15	8.14	9.58	8.41	8.41	-12.2%
Cocoa	0.54	0.56	0.52	0.30	0.28	0.34	14.7%

- Yields in the **State sector** declined in all product categories, except: *viandas*, vegetables, and citric fruits.
- This can be (partially) explained by the fact that output declined at a slower rate than area under cultivation for these categories
- Climate, soil conditions, access to inputs (i.e. fuels, fertilizers, irrigation systems) and other essential resources (i.e. water, sufficient sunlight, soil nutrients, etc.) also explain recent tendencies in crop yields.
- In 2010 yields in the State sector were higher than yields in the private sector in all product categories except: Beans, tobacco, other fruits, and cocoa.
- These differences can be explained by recent trends in output and areas under cultivation in these product categories.

IV. CONCLUSIONS

- BETWEEN 2008 AND 2010:
- OUTPUT declined in 5 out of 9 product categories (non-sugar agriculture)
- During the same period, output in the State sector fell all product categories (7 out of 9) except beans and cocoa.
- Output in the private sector was also mixed, with decreases in 5 out of 9 product categories.
- 2006 appears to be an “inflection point” after which output gradually recovers in some products, while it declines in others.
- With the exception of rice, area under cultivation seems to be a poor predictor of output.
- YIELDS experienced a downward trend in both the State and non-State sectors.
- Paradoxically, yields in the non-State sector were lower , except for beans, tobacco, and cocoa.
- These trends suggest that Cuban agriculture is following, albeit at a moderate rate, the path of other centrally-planned economies in which non-State actors are given a greater role.