MEASURING CUBA'S AGRICULTURAL TRANSFORMATIONS: PRELIMINARY FINDINGS

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OUTLINE

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II. METRICS, EXPECTED OUTCOMES & STATISTICAL ISSUES
III. PRELIMINARY FINDINGS
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I. Institutional Framework

- ***Deree 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

VIANDAS				*RICE*			
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%**
PLANTAINS				*BEANS*			
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%**
VEGETABLES				*CITRIC FRUITS*			
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%**

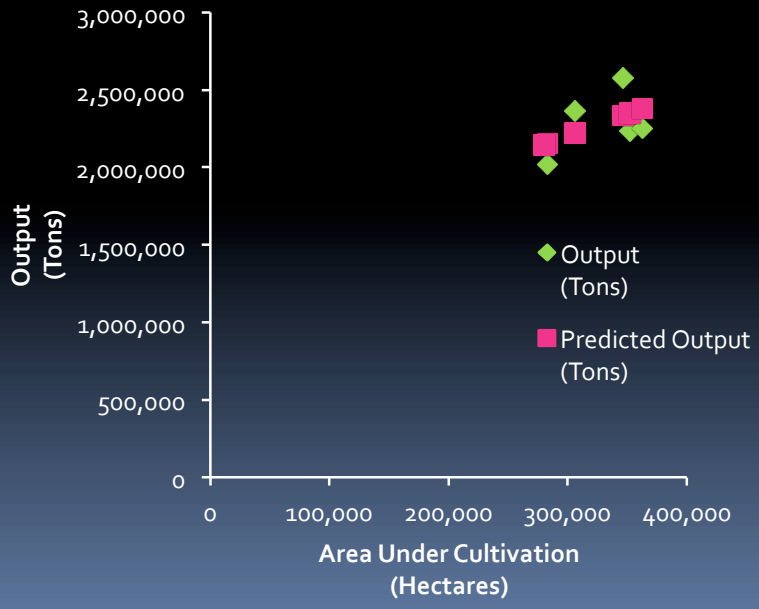
III. PRELIMINARY FINDINGS: Regression

TABLE 2. SELECTED REGRESSION OUTPUT SUMMARY

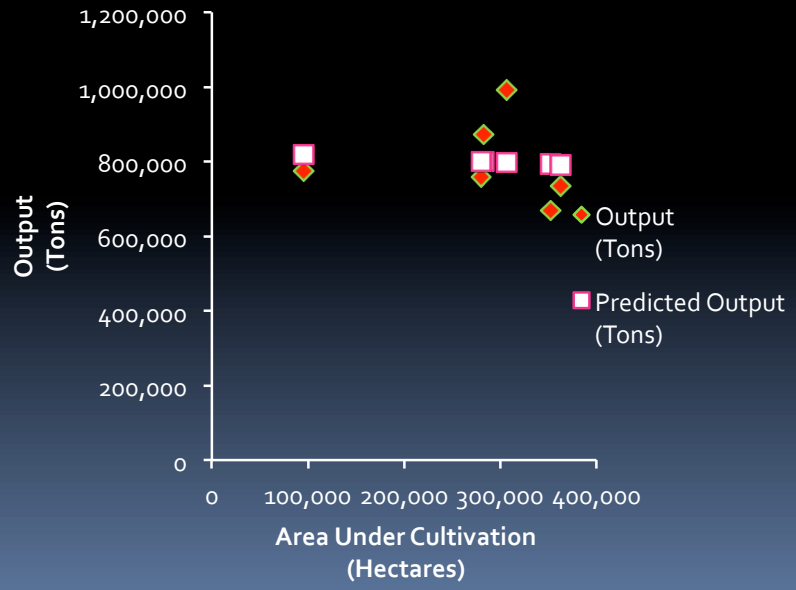
Regression analysis: ***Is area under cultivationa predictor of output?***

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**

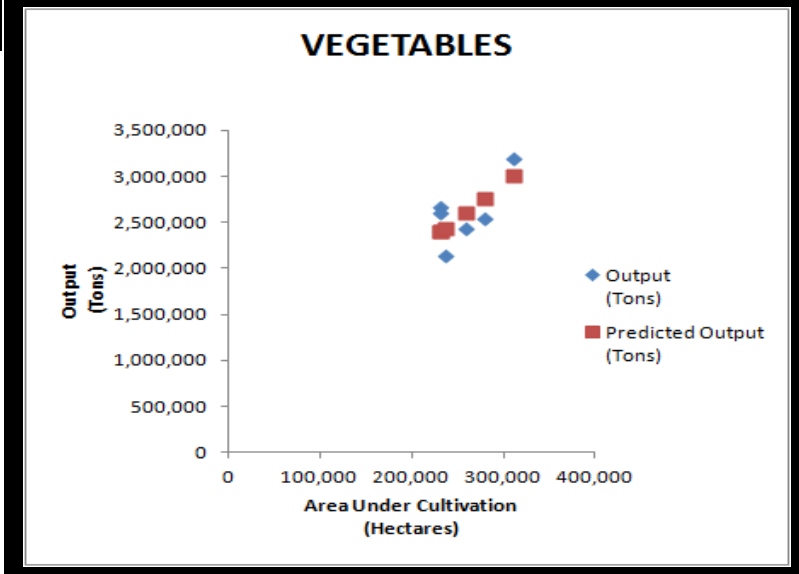
VIANDAS

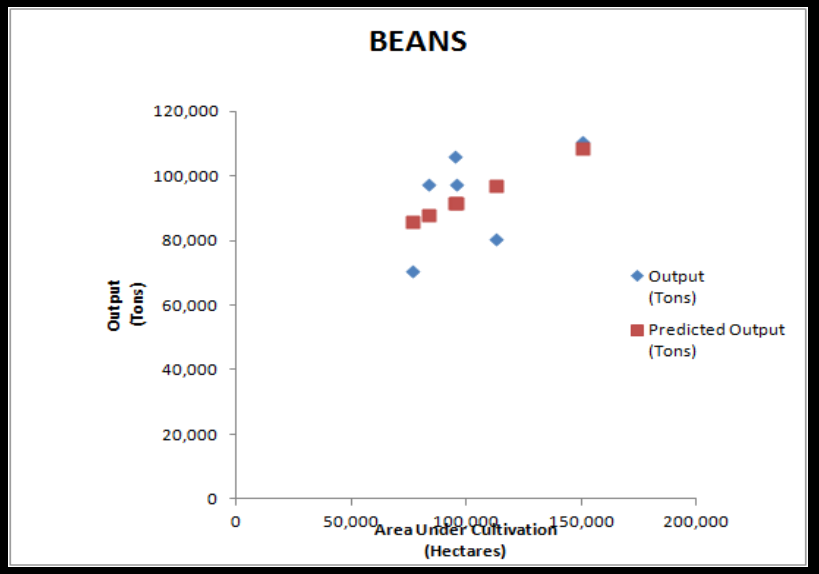


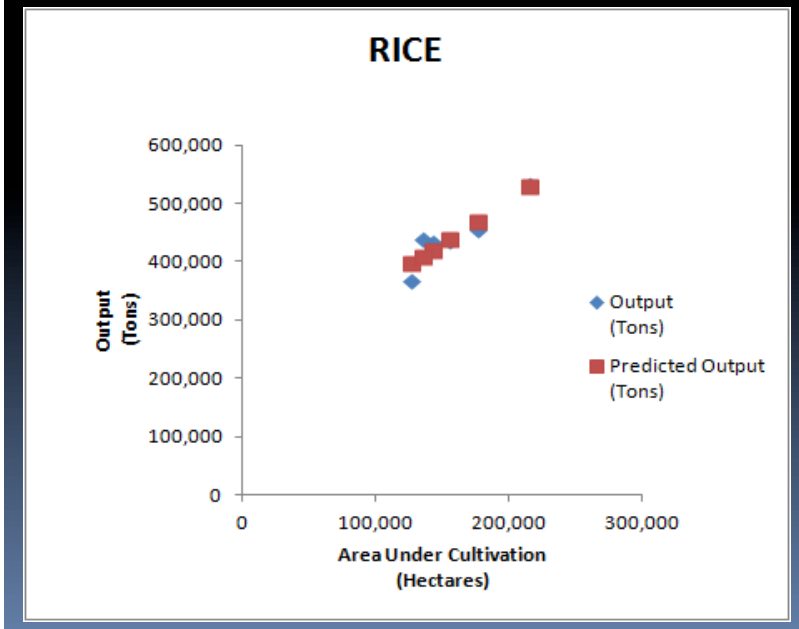
PLANTAINS

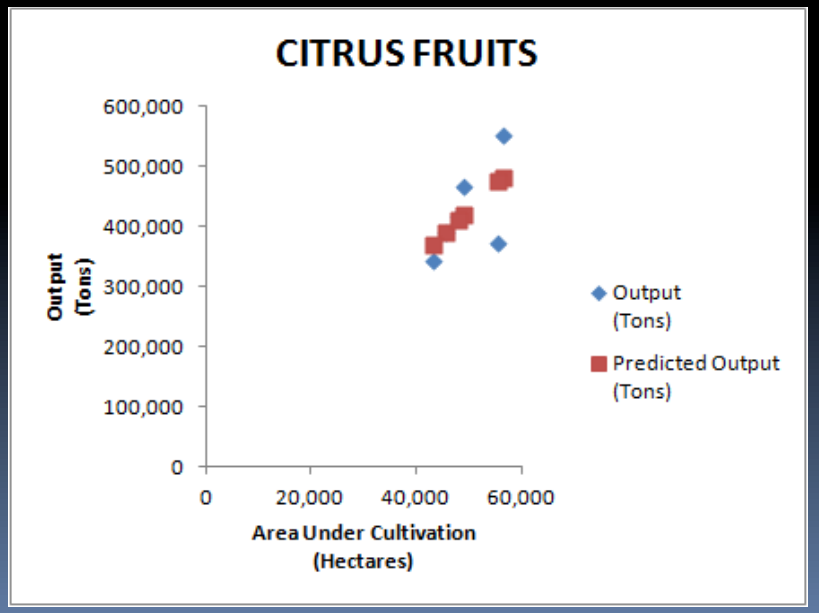


III. PRELIMINARY FINDINGS: Regression Results









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, an d 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.**