

# Brazilian Sugar and Grain Markets – Interaction from the Farm Level Perspective

Samuel Balieiro

Thünen Institute of Farm Economics



*Global Forum*  
Goiania, July 16<sup>th</sup> 2015

# Agenda

## 1. Background

## 2. Important facts

## 3. Economics of grower's cropping decisions

- Economic analyses
- Acreage allocation process
- Long-term price interactions

## 4. Conclusions

# Agenda

## 1. Background

## 2. Important facts

## 3. Economics of grower's cropping decisions

- Economic analyses
- Acreage allocation process
- Long-term price interactions

## 4. Conclusions

# 1.1 Brazilian Biomes - Cerrado

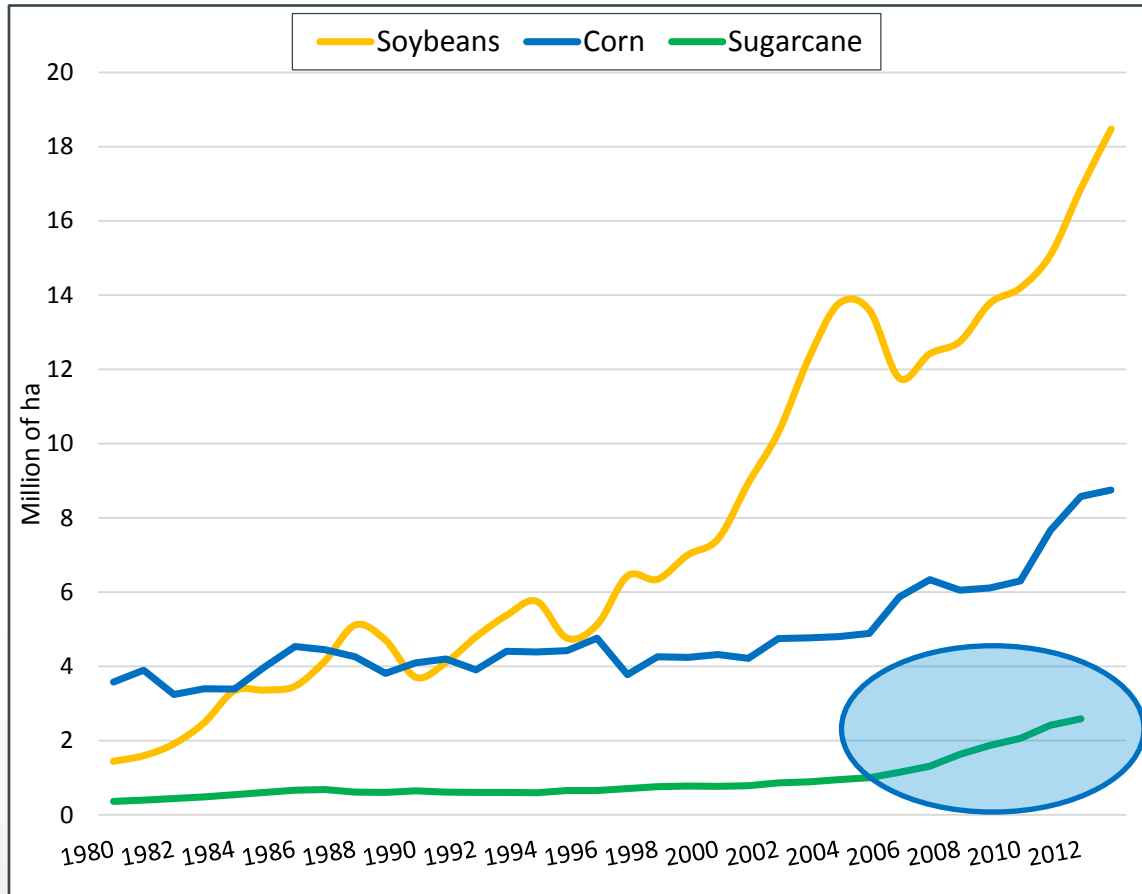


**Fig 1.** Brazilian Biomes.  
Source: IBGE (2014)

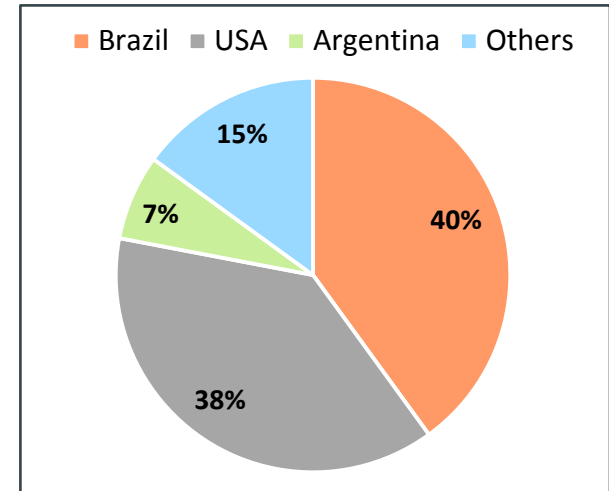


**Fig 2.** Typical native vegetation in Cerrado.  
Source: Panoramio (2014)

## 1.2 Evolution of cropping patterns in Cerrado



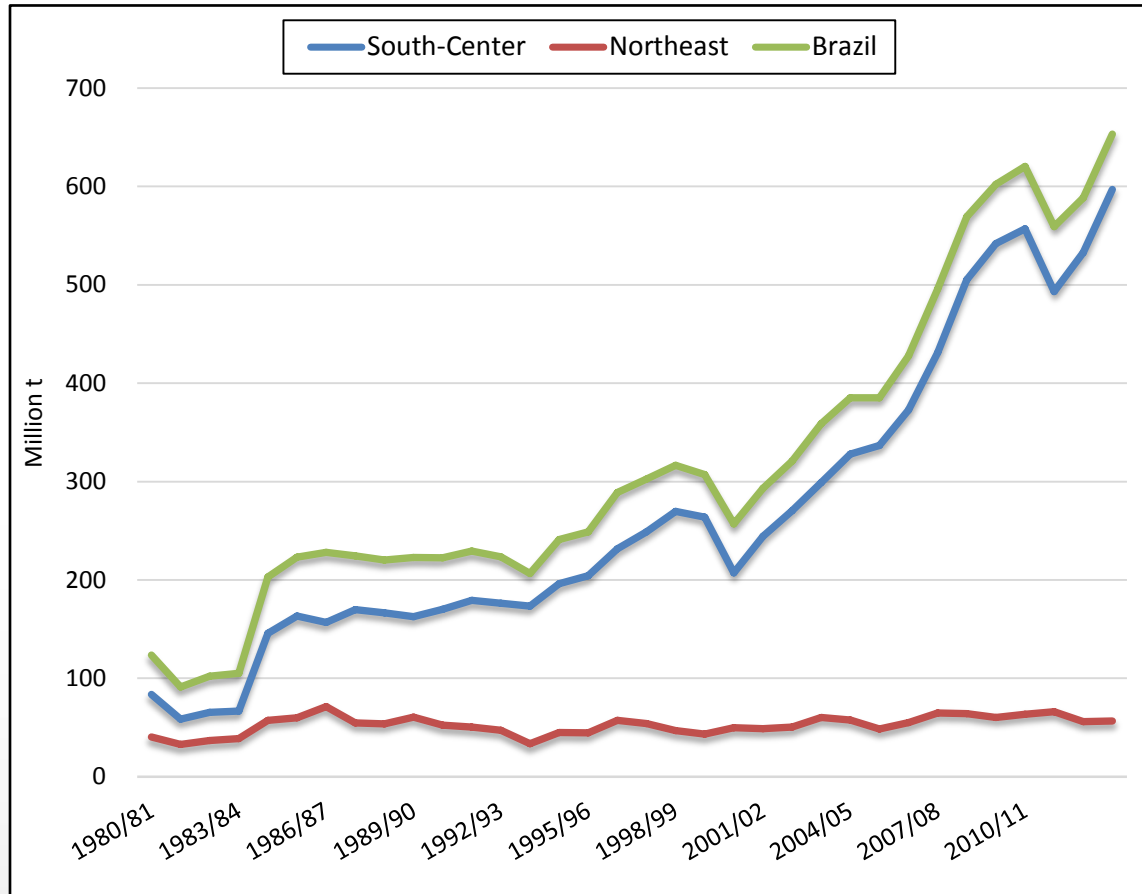
**Fig 3.** Acreage development of Soybean, Corn and Sugarcane in the Cerrado.  
Source: UNICA (2012) and CONAB (2014) - own calculations.



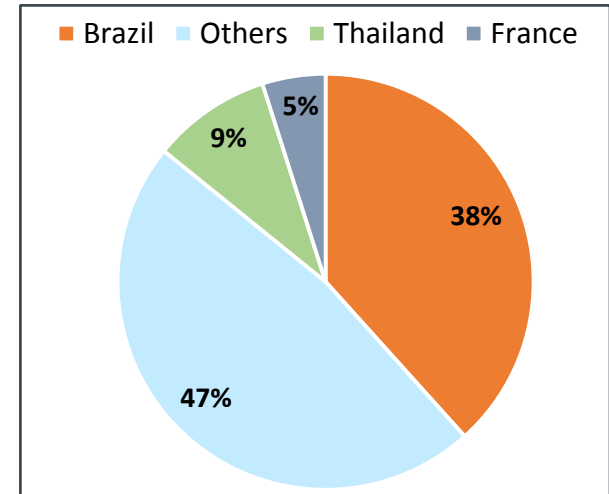
**Fig 4.** Soybean exporters (value in 2013)  
Source: ITC (2014)

- Brazil - Major exporter  
1<sup>st</sup> soybean  
2<sup>nd</sup> corn
- Importance of the Cerrado

## 1.3 Evolution of sugarcane in Brazil



**Fig 5.** Sugarcane production in selected regions in Brazil (1980 – 2013)  
Source: UNICA (2014) – own calculations.



**Fig 6.** Sugar exporters (value in 2013)  
Source: ITC (2014)

- Major sugar exporter
- Ethanol – domestic consumption (90%)

## 1.4 Commodity price relationship

- In theory, competing commodity markets show a price interaction (supply responses) – (Tomek & Kaiser, 2014)
- Soybean and corn in the US – (Gardner, 1976)
- Hypotheses: Grain and sugarcane competing for land leads to a price correlation

**Tab 1.** Correlation matrix of selected Brazilian commodity prices (2008 – 2014)

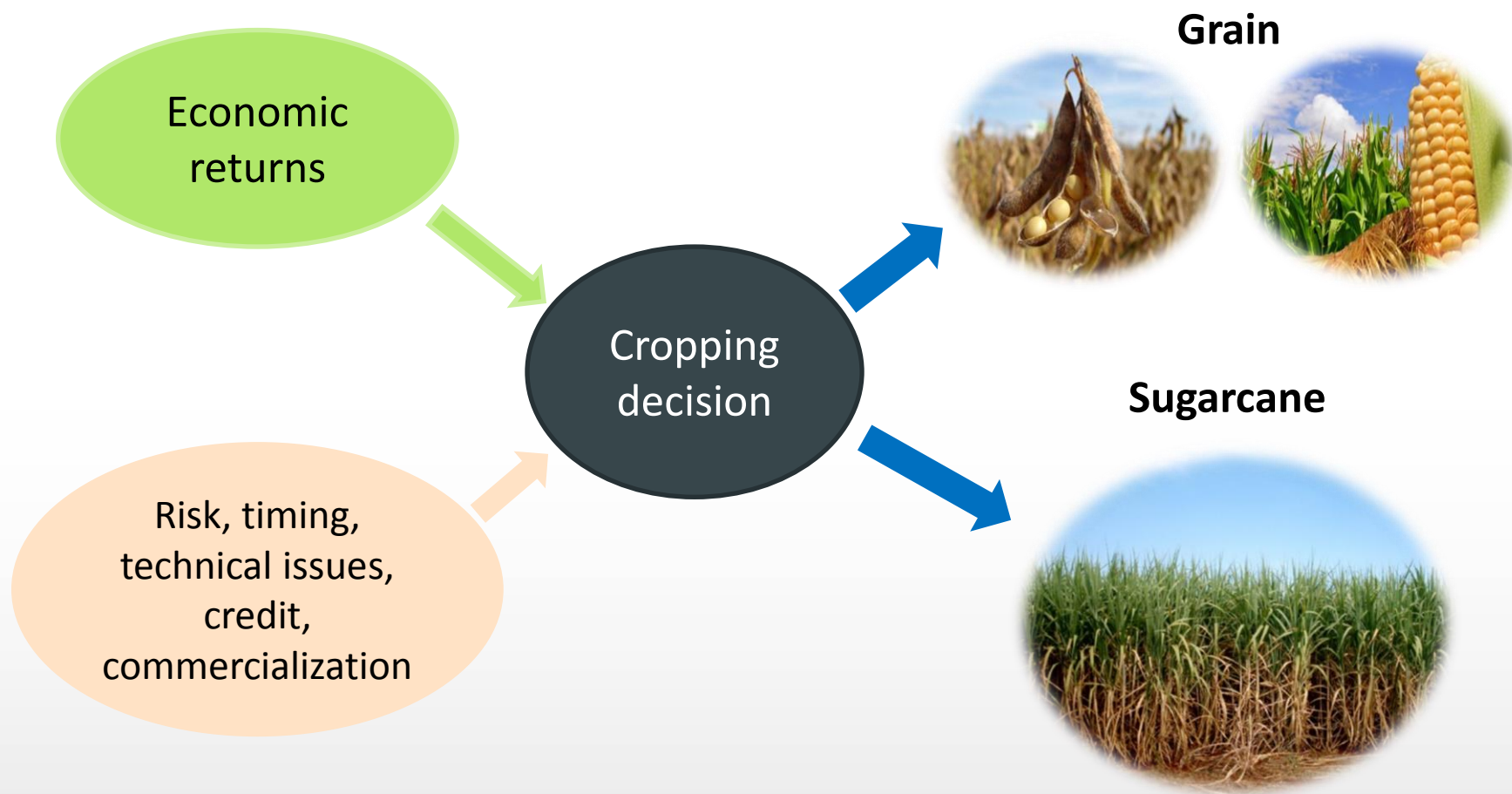
Variable	Correlation coefficients		
	Soybean	Corn	Sugar
Soybean	1.000		
Corn	0.526***	1.000	
Sugar	0.105***	0.197***	1.000

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ;  $n = 1611$

Source: CEPEA, index (2014) – own calculations.



## 1.5 Farmer' supply response – cropping decisions





# Agenda

1. Background

**2. Important facts**

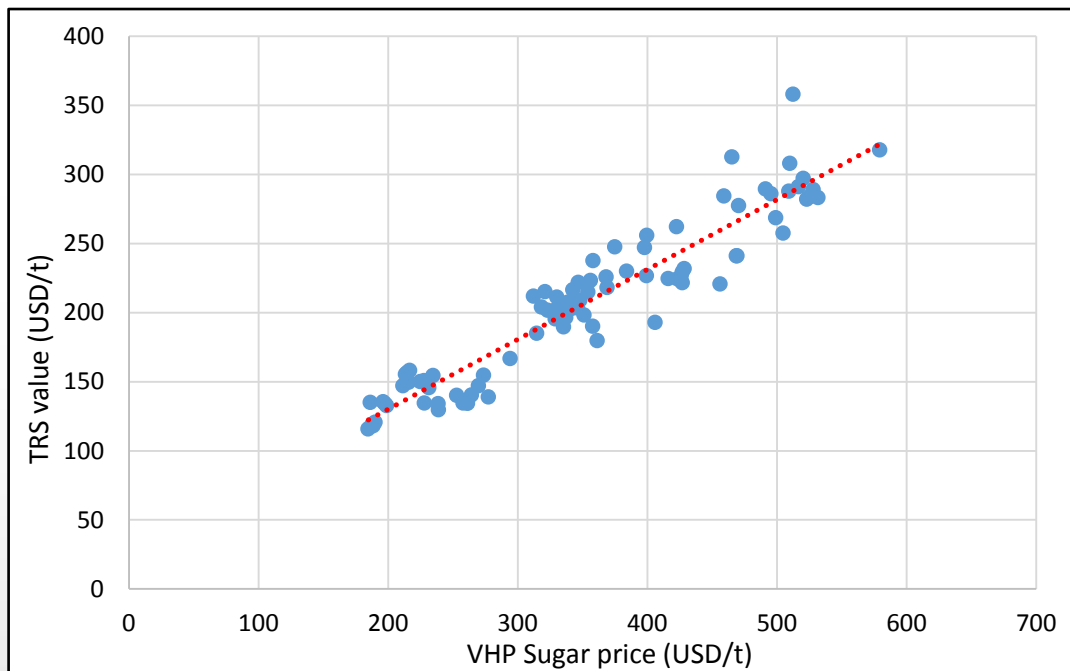
3. Economics of grower's cropping decisions

- Economic analyses
- Acreage allocation process
- Long-term price interactions

4. Conclusions

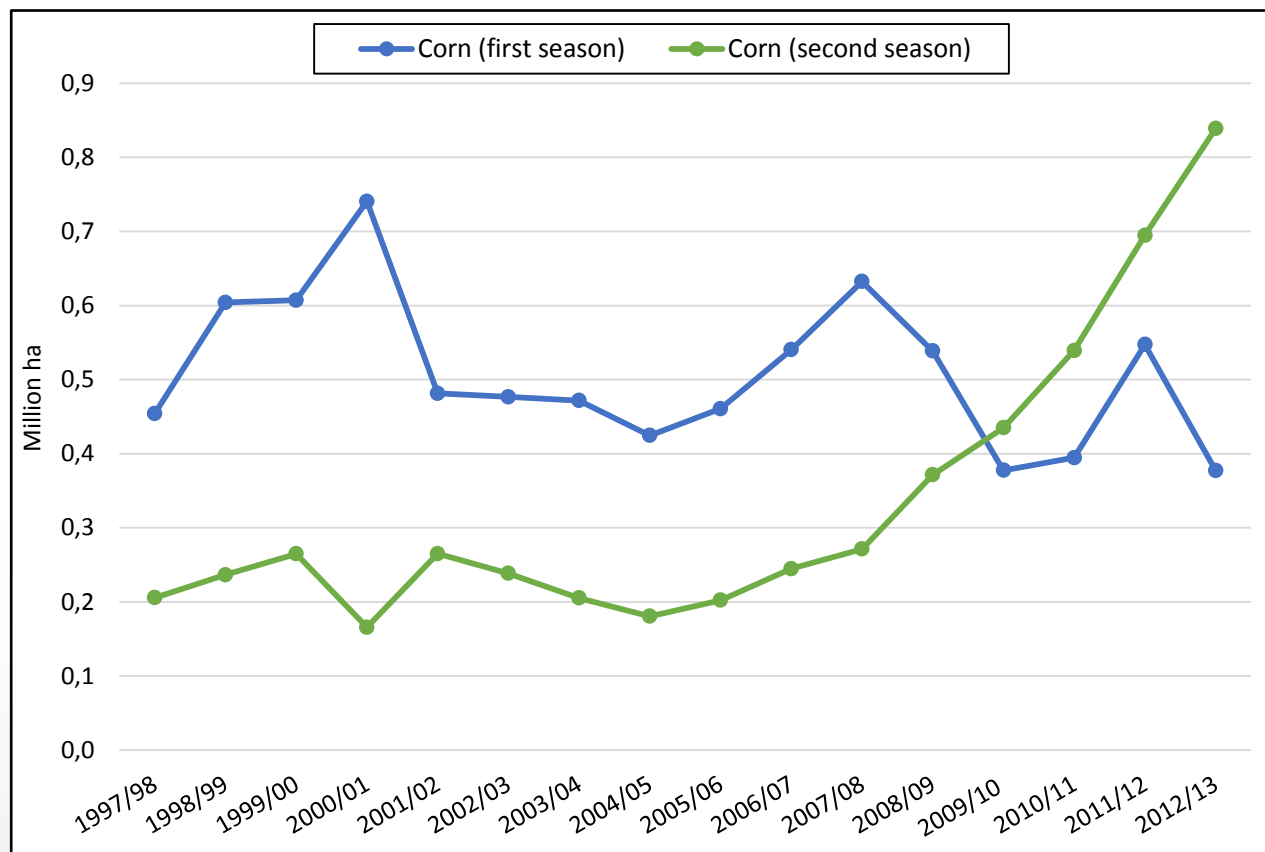
## 2.1 Finding equilibrium prices

- Approach
  - Finding equilibrium TRS values – equal returns
  - Complex interaction between sugarcane final products
  - OLS Regression to estimate TRS equilibrium



Variables	Coefficients (1)
VHPS price	TRS price 0.506 (27.42)***
Constant	28.94 (4.29)***
* p<0.10, ** p<0.05, *** p<0.01; n= 89 R-squared = 0.90 Absolute value of t statistics in parentheses Note: Monthly data from 04.2007 to 08.2014. Source: CEPEA, UNICA, own calculations (2014)	

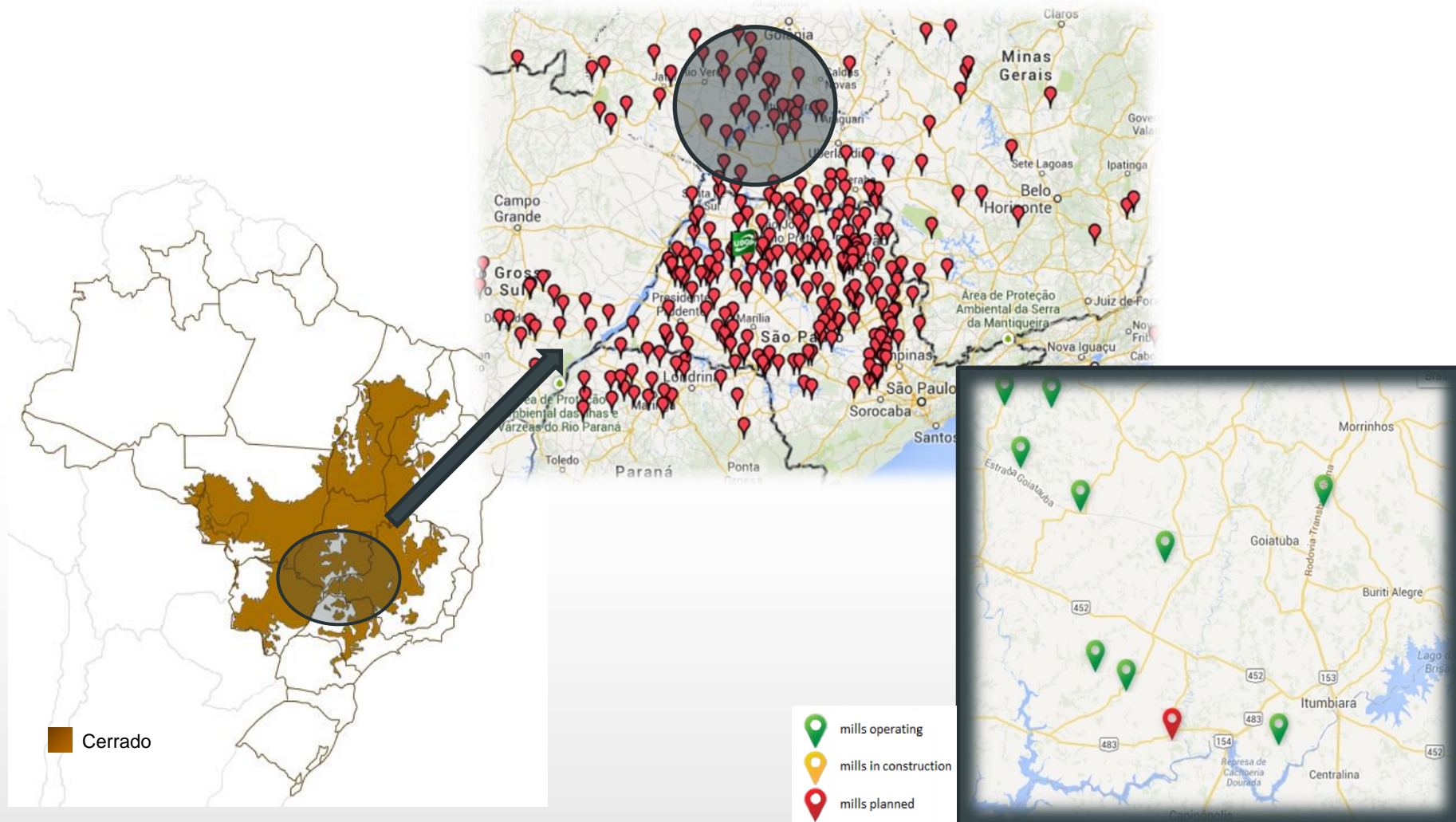
## 2.2 Double-cropping



- Soybean followed by corn cultivation
- Increase in utilization of D.C. in the region
- Corn hybrids
- Currently est. 30% of the soybean area

**Fig 8.** Development of acreage devoted to Corn for the 1<sup>st</sup> and 2<sup>nd</sup> seasons – in Goiás from 1997 to 2013. Source: CONAB (2014) – own calculations

## 2.3 Research area



# Agenda

1. Background

2. Important facts

3. Economics of grower's cropping decisions

- Economic analyses
- Acreage allocation process
- Long-term price interactions

4. Conclusions

# 3.1 Description of the typical farm

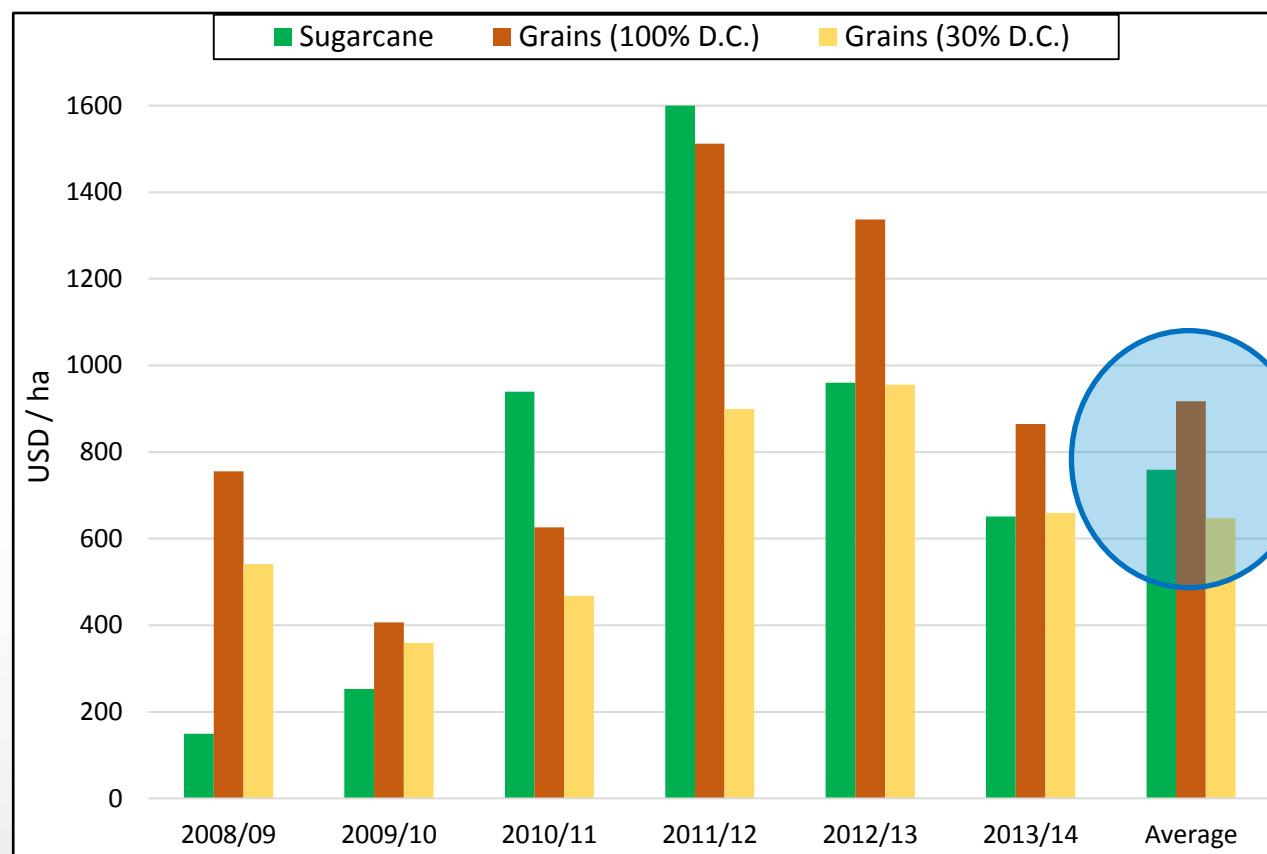
**Tab 2.** Key values used for the analysis of the typical farm BR6300GO (2013)

Description		Values		
	Unit	Soybean	Corn	Sugarcane
Crop yield	t/ha	2.82	6.0	71.38 <sup>1</sup>
Arable land	ha	5,000	5,000	1,300
Double cropping	%	100	100	0
Price	USD/t	418	148	29
Harvesting & Logistics (HLT)	USD/t	-	-	8.9
Land ownership	%	60	60	60
Labor input	USD/ha	84	70	10
Machinery input	USD/ha	96	75	10
Contractor (outsourced)	USD/ha	0	0	800

<sup>1</sup> Sugarcane average (fresh): 5 ratoons (first two 94 t and later 80 t) and the first year zero (crop establishment) – average weighted by the share of area of each stage in the total acreage.

## 3.2 Returns to land

- Estimated from 2008 – 2014

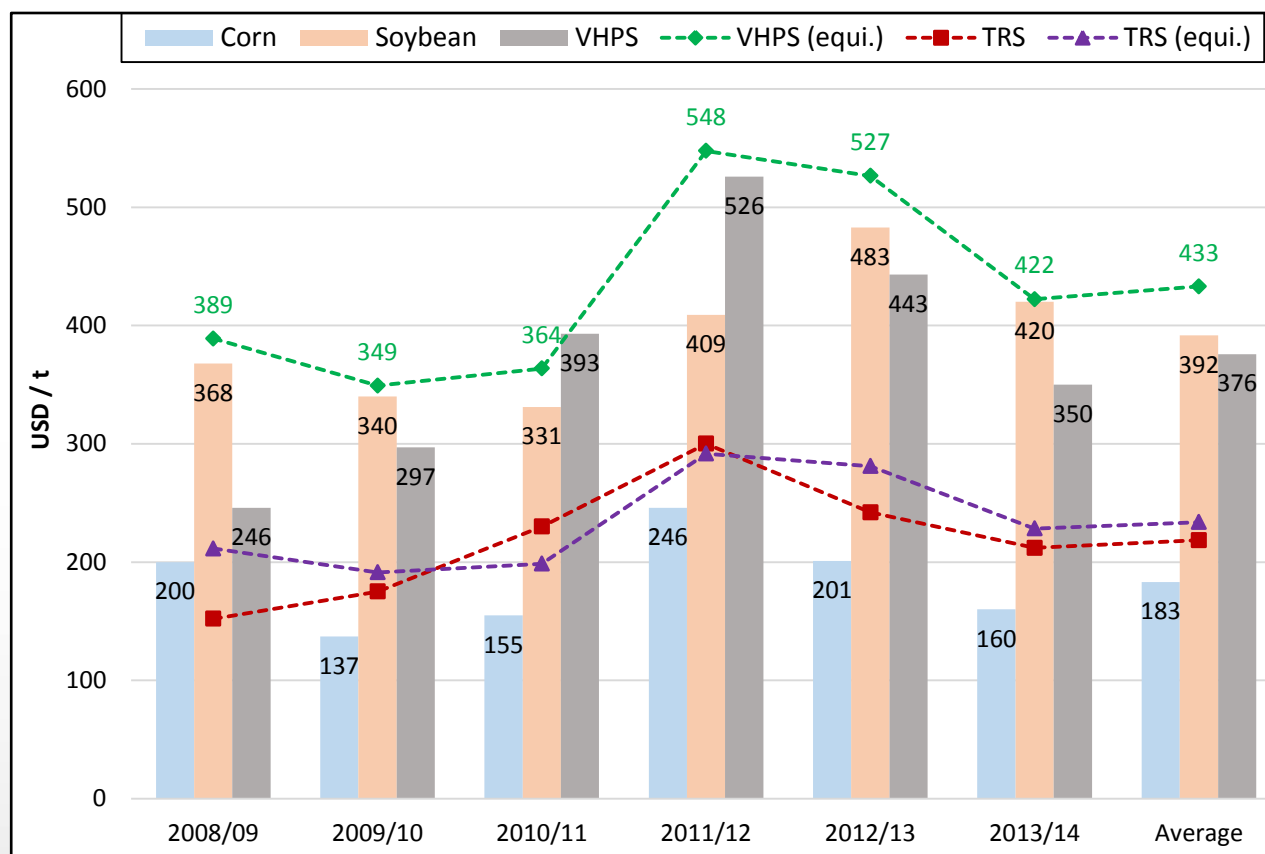


**Fig 12.** Estimated returns to land for the BR6300GO from 2008 to 2014  
Source: UNICA, CONAB, Agrolink, OANDA (2014) - own calculations

- Strong variation in returns – no absolute leading alternative
- On average, cane brought higher returns than current levels of D.C. (30%)
- Competitiveness of sugarcane – depending on D.C.



## 3.3 Equilibrium price

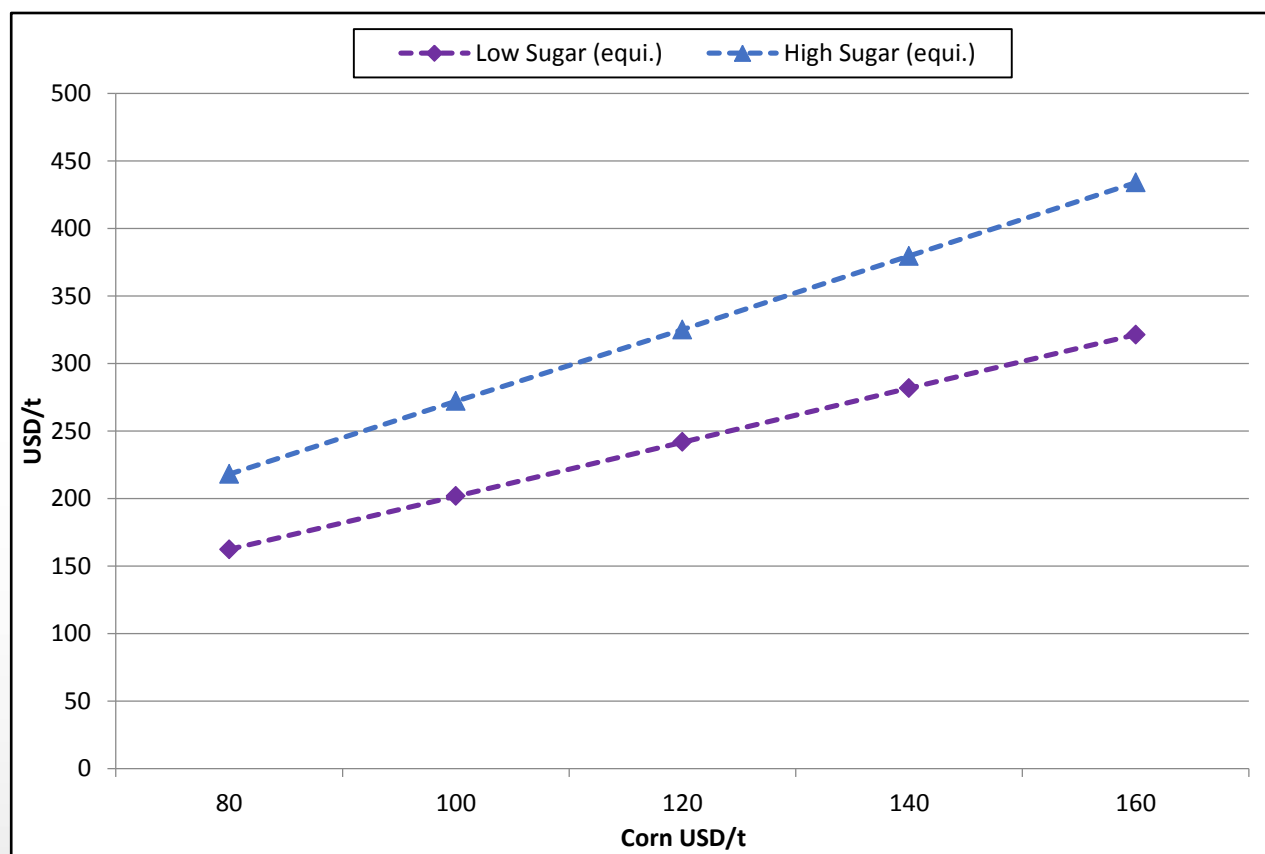


**Fig 14.** Observed commodities prices, TRS & VHPS and their estimated equilibrium prices in the typical farm. Source: UNICA, CONAB, AgroLink, OANDA (2014) - own calculations

- Similar patterns TRS equi. and observed TRS
- Price relationship between grain and TRS
- Relatively high prices in the period analyzed

## 3.4 Long-term equilibrium

- Long-term equilibrium



**Fig 15.** Estimated long-term equilibrium prices for VHP sugar for a set of soybean and corn prices. Source: CEPEA (2014) – own calculations

- “Band” of expected VHPS price
- Corn USD 100/t – expected sugar equilibrium - USD 200 and 250/t
- No major cropping changes within the “Band”

# Agenda

## 1. Background

## 2. Important facts

## 3. Economics of grower's cropping decisions

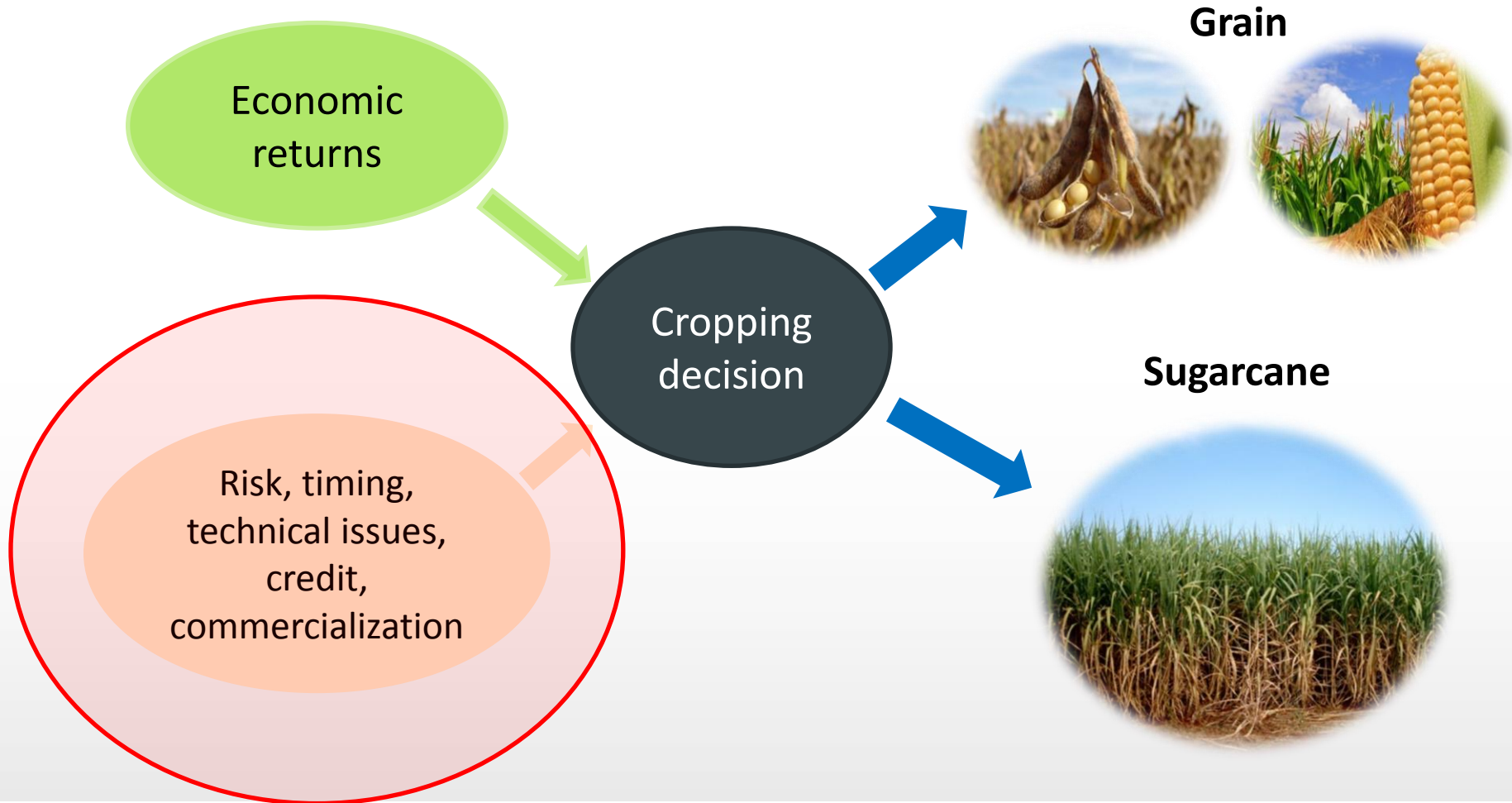
- Economic analyses
- Acreage allocation process
- Long-term price interactions

## 4. Conclusions

## 4. Conclusions

- Brazil is a major exporter of corn, soybean and sugar
- The competition between these crops might affect international markets
- The competition situation is an important issue for BR farms and companies
- Sugarcane has different cash requirements
  - Availability of partnership?
- Price relationship between grain and sugar markets
- Returns required to cover additional factors
- Other products – Ethanol and Energy

# Farmer' supply response – cropping decisions



# Thank you for your attention!



## Samuel Ferreira Balieiro

Member of **agri benchmark** Cash Crop team -

Thünen Institute of Farm Economics  
Bundesallee 50, 38116 Braunschweig  
Germany

phone	+49 - 531-596-5109
mobile	+49 – 152-2311-1071
e-mail	<a href="mailto:samuel.balieiro@ti.bund.de">samuel.balieiro@ti.bund.de</a>
internet	<a href="http://www.agribenchmark.org">www.agribenchmark.org</a>
	<a href="http://www.ti.bund.de">www.ti.bund.de</a>

# References

- Ai, C., Chatrath, A., & Song, F. (2006). On the Comovement of Commodity Prices. *American Journal of Agricultural Economics*, 88(3), 574–588. doi:10.1111/j.1467-8276.2006.00880.x
- ANFAVEA. (2014). Statistics - Production of new cars by fuel. Retrieved from <http://www.anfavea.com.br/tabelas.html>
- Baccarin, J. G., Gebara, J. J., & Factore, C. O. (2009). Concentration and Vertical Integration of Sugar and Ethanol Industry in South-Center region of Brazil, between 2000 and 2007 (Concentração e Integração Vertical do Setor Sucroalcooleiro no Centro-Sul do Brasil, entre 2000 e 2007). *Informações Econômicas*, 39(3), 1–12. Retrieved from <http://www.fcav.unesp.br/Home/departamentos/economiarural/concentracao-e-integracao-sucroalcooleira.pdf>
- CEPEA. (2012). Sugar Prices Indicators for the International Market - Detailed Methodology (Indicadores de Preços de Açúcar para o Mercado Internacional Detalhamento Metodológico). Piracicaba. Retrieved from <http://cepea.esalq.usp.br/IndAcucarInternac2012.pdf>
- CONAB. (2014). National Company of Supplying -Time Series. Retrieved from [http://www.conab.gov.br/conteudos.php?a=1252&&Pagina\\_objcmsconteudos=2#A\\_objcmsconteudos](http://www.conab.gov.br/conteudos.php?a=1252&&Pagina_objcmsconteudos=2#A_objcmsconteudos)
- CONSECANA. (2006). Instruction Manual (Manual de Instruções). Piracicaba. Retrieved from [http://www.orplana.com.br/manual\\_2006.pdf](http://www.orplana.com.br/manual_2006.pdf)
- CONSECANA. (2014). Circular n. 1813. Retrieved from [http://www.udop.com.br/download/consecana/sp/safra\\_13\\_14/circular\\_18\\_13.pdf](http://www.udop.com.br/download/consecana/sp/safra_13_14/circular_18_13.pdf)
- Gardner, B. L. (1976). Future Prices in Supply Analysis. *American Journal of Agricultural Economics*, 58(1), 81–84.
- IBGE. (2014). Brazilian Biomes - Map: IBGE. Retrieved from <http://www.ibge.gov.br/home/presidencia/noticias/21052004biomashtml.shtm>
- ITC (2014). Trade in value of distinct products. <http://www.intracen.org>



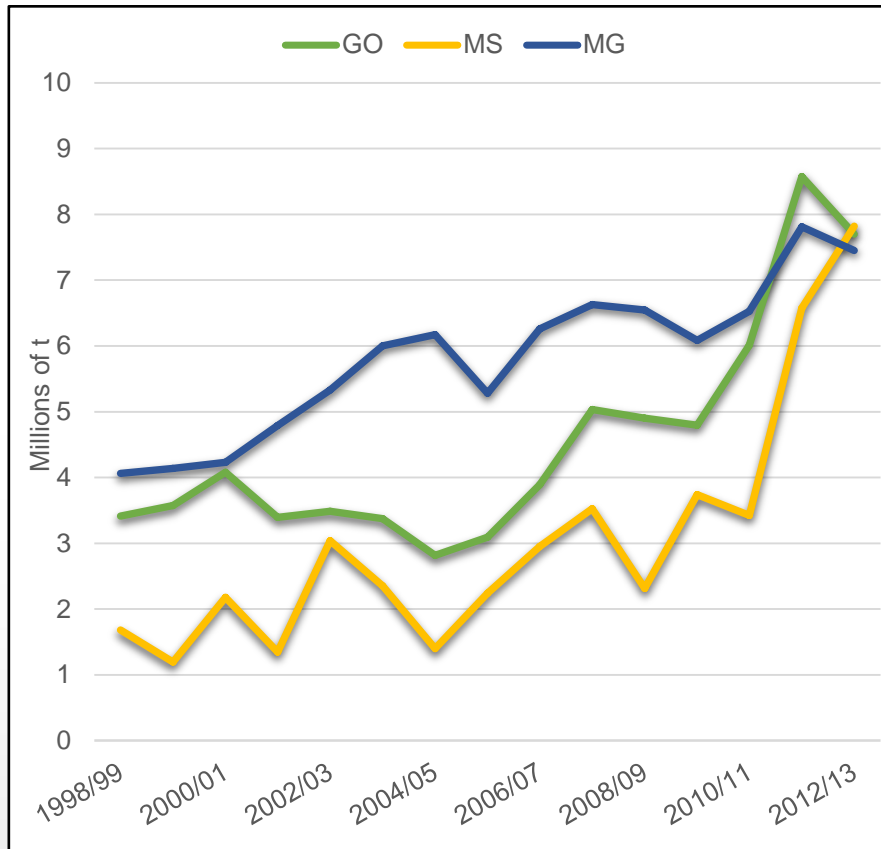
# References

- OANDA. (2014). Currency converter - Historical Exchange Rates. Retrieved from <http://www.oanda.com/currency/historical-rates/>
- PECEGE. (2013). Production Cost fo Sugarcane, Sugar and Ethanol in Brazil (Custos de Produção de Cana de Açúcar, Açúcar e Etanol no Brasil). Piracicaba. Retrieved from <http://pecege.dyndns.org/>
- RPA consultancy. (2014). Sugar mills (Usinas). Ribeirão Preto. Retrieved from <http://www.rpaconsultoria.com.br/telas/usinas.asp>
- Tomek, W. G., & Kaiser, H. M. (2014). Agricultural product prices: Cornell University Press.
- UDOP. (2014). Maps of Sugar Mills and Destillaries. Retrieved from [http://www.udop.com.br/index.php?item=consecana\\_sp&op=index#](http://www.udop.com.br/index.php?item=consecana_sp&op=index#)
- UNICA. (2014a). Annual Brazilian sugar export by state. Retrieved from <http://www.unicadata.com.br/listagem.php?idMn=43>
- UNICA. (2014d). Annual registration of new vehicles in Brazil (Otto cycle) by fuel type. Retrieved from <http://www.unicadata.com.br/listagem.php?idMn=54>
- UNICA. (2014c). Sugarcane Production and Processing - per Specific Product. Retrieved from <http://www.unicadata.com.br/historico-de-producao-e-moagem.php?idMn=31&tipoHistorico=2>
- UNICA. (2012). Sugarcane planted area, 1995 - 2012. Retrieved from <http://www.unicadata.com.br/historico-de-area-ibge.php?idMn=33&tipoHistorico=5>
- USDA. (2014). Soybean Oilseed Exports by Country. Retrieved from <http://www.indexmundi.com/agriculture/?commodity=soybean-oilseed&graph=exports>
- WWF. (2014). Brazilian Biomes - Cerrado. Retrieved from [http://assets.wwf.org.br/downloads/cerrado.pdf?\\_ga=1.179400292.1743345810.1409844076](http://assets.wwf.org.br/downloads/cerrado.pdf?_ga=1.179400292.1743345810.1409844076)

**For all references please see the written document**

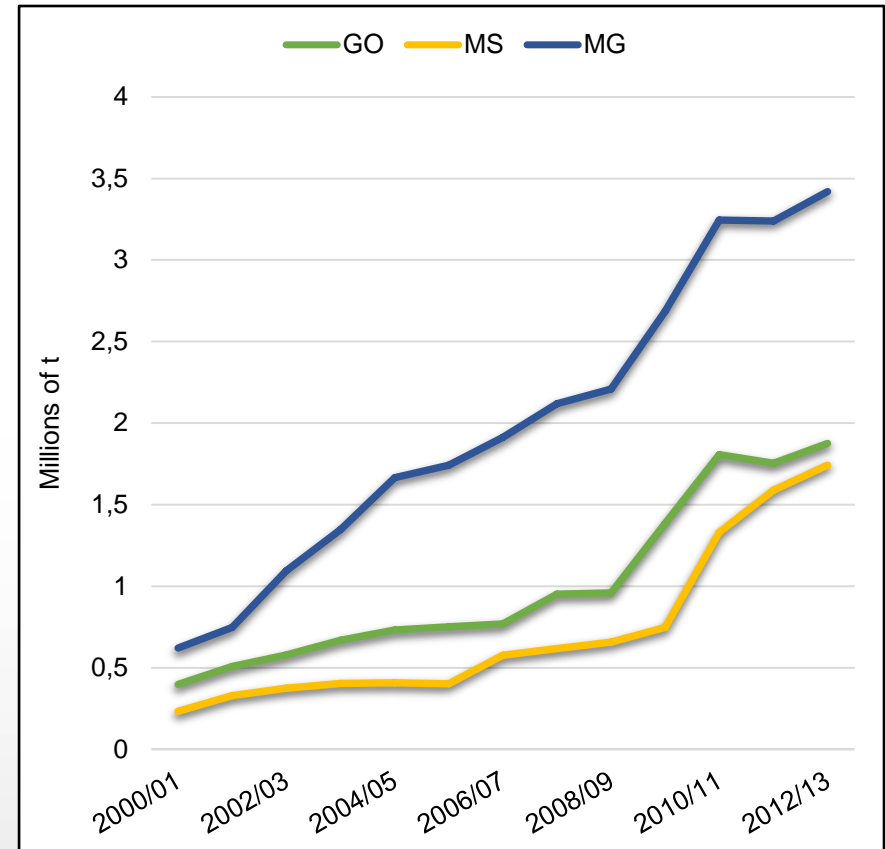
# Appendices

Appendix A: Corn production of Selected States (millions of tons)



Source: (CONAB, 2014) – own calculations

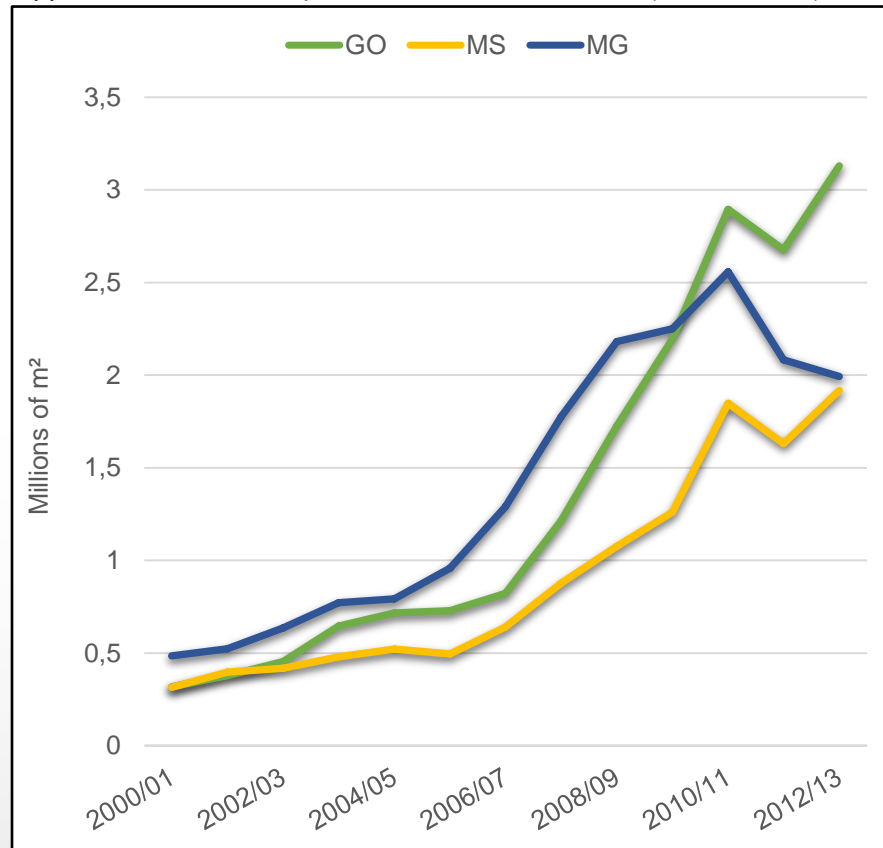
Appendix B: Sugar Production of Selected States (millions of tons)



Source: (UNICA, 2014c) – own calculations

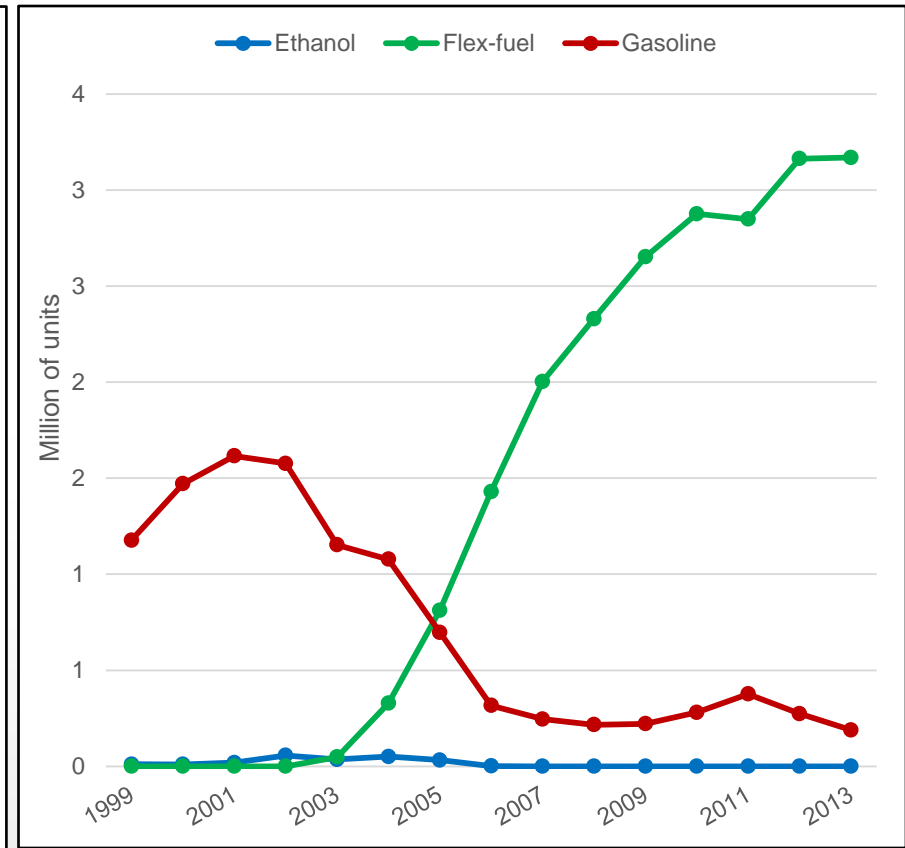
# Appendices

Appendix C: Ethanol production of selected states (millions of m<sup>3</sup>)



Source: [\(UNICA, 2014c\)](#) – own calculations

Appendix D: Production of new of light vehicles in Brazil (Otto Cycle)



Source: 1999 to 2002 [\(ANFAVEA, 2014\)](#) and 2003 to 2013 [\(UNICA, 2014d\)](#) – own calculations

# Appendices

## Appendix E: Sample of the questionnaire – addressed issues and questions

Addressed issues	Question
Indicators	(1) What success indicator (return to land, gross margin, etc.) is relevant for growers? How do they evaluate the marketing opportunities?
Time horizon	(2) What time span do they consider?
Economic Premium	(3) Do farmers look for a certain premium for renting out land over the alternative to crop themselves?
Access to credits	(4) Is the decision of the crop portfolio influenced by cost/access of credit to finance machinery and/or inputs? In case yes, what are the terms and conditions under which they have access to credit?
Marketing opportunities	(5) In how far are farmers bound to supply the sugarcane to this specific sugar mill in case it does the sugarcane establishment? Which are the payment conditions?
Risk	(6) How does risk influence the production decision?
Land markets	(7) Do farmers rent in land to produce sugarcane? Has the rent increased significantly in the last years?
Storage	(8) In how far is storage a relevant issue for the crop portfolio decision?
Overall farm performance	(9) Do farmers consider the higher utilization of farm's capital (e.g. labor and machinery) as incentive to the diversification of having grains and sugarcane?
Double-cropping	(10) How important is the opportunity of double cropping (soybean in summer and corn in winter) in the decision of producing sugarcane?

# Appendices

## Appendix F: Derivation of the TRS average value - the relationship between TRS and the sugarcane final product prices (2013)

Product <sup>1</sup>	Final Product	Conversion factor	Quantity in TRS	Share	Final product price	TRS
	(t)		(t)	(%)	(USD/kg -/l)	(USD/kg)
WS (DM) <sup>2</sup>	4,989,207	1.0495	5,236,173	11%	0.4362	0.2299
WS (IM)	2,385,405	1.0495	2,503,482	5%	0.3923	0.2224
VHPS (IM)	16,581,110	1.0453	17,332,234	35%	0.3495	0.1989
AE (fuel)	5,292,067	1.7492	9,256,884	19%	0.6379	0.2264
HE (fuel)	5,756,359	1.6761	9,648,234	20%	0.5647	0.2092
AE (Ind.)	182,402	1.7492	319,058	1%	0.6503	0.2308
HE (Ind.)	493,248	1.6761	826,733	2%	0.5737	0.2125
AE (IM)	1,492,659	1.7492	2,610,959	5%	0.6202	0.2201
HE (IM)	723,629	1.6761	1,212,875	2%	0.5632	0.2086
Total			48,946,634	100		<b>0.2125</b>

<sup>1</sup> domestic market (DM); international market (IM); Industry (Ind.); white sugar (WS); Very high polarized sugar (VHPS); Anhydrous ethanol (AE); Hydrous ethanol (HE).

<sup>2</sup> The white sugar for domestic market has a tax correction factor of 0.93.

Source: CONSECANA (2014), OANDA (2014) - own calculations.