



Instituto Nacional de Investigación Agropecuaria
U R U G U A Y

Cereal chemistry research in a small country: strategies to move on



U R U G U A Y

Daniel Vázquez

4th ICC Latin American Cereals Conference

13th International Gluten Workshop

11-17 March 2018
Mexico City, Mexico



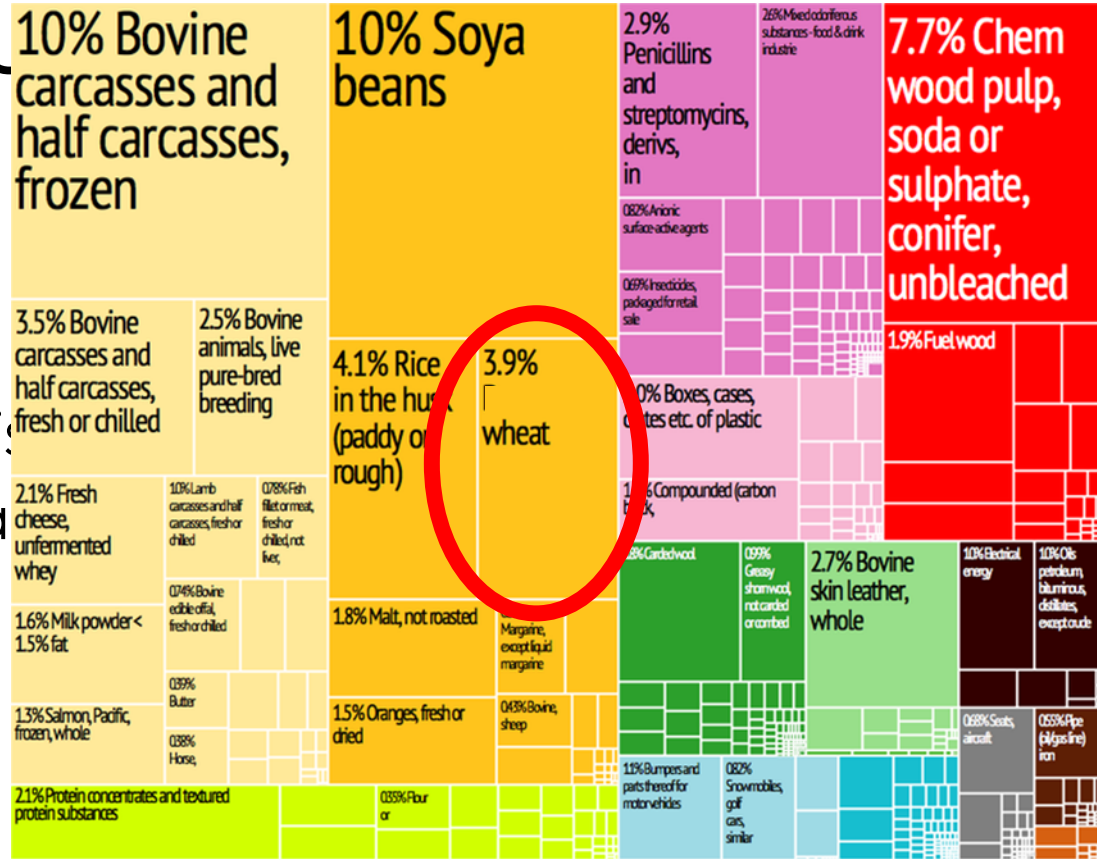
Uruguay

- People: 3.4 in 7600 millions = 0.05%
- Wheat: 1:2 vs 691 millions tonnes* = 0.18%
(average 10 years)

* <http://www.fao.org/faostat>

Urugu

- People:
- Wheat:
- Wheat is
- Importa



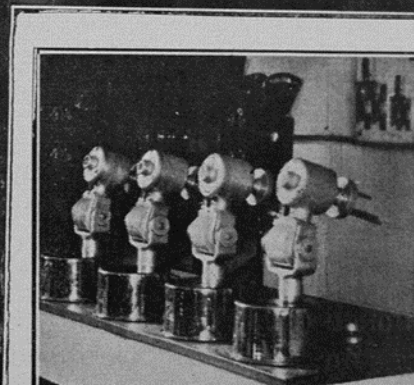
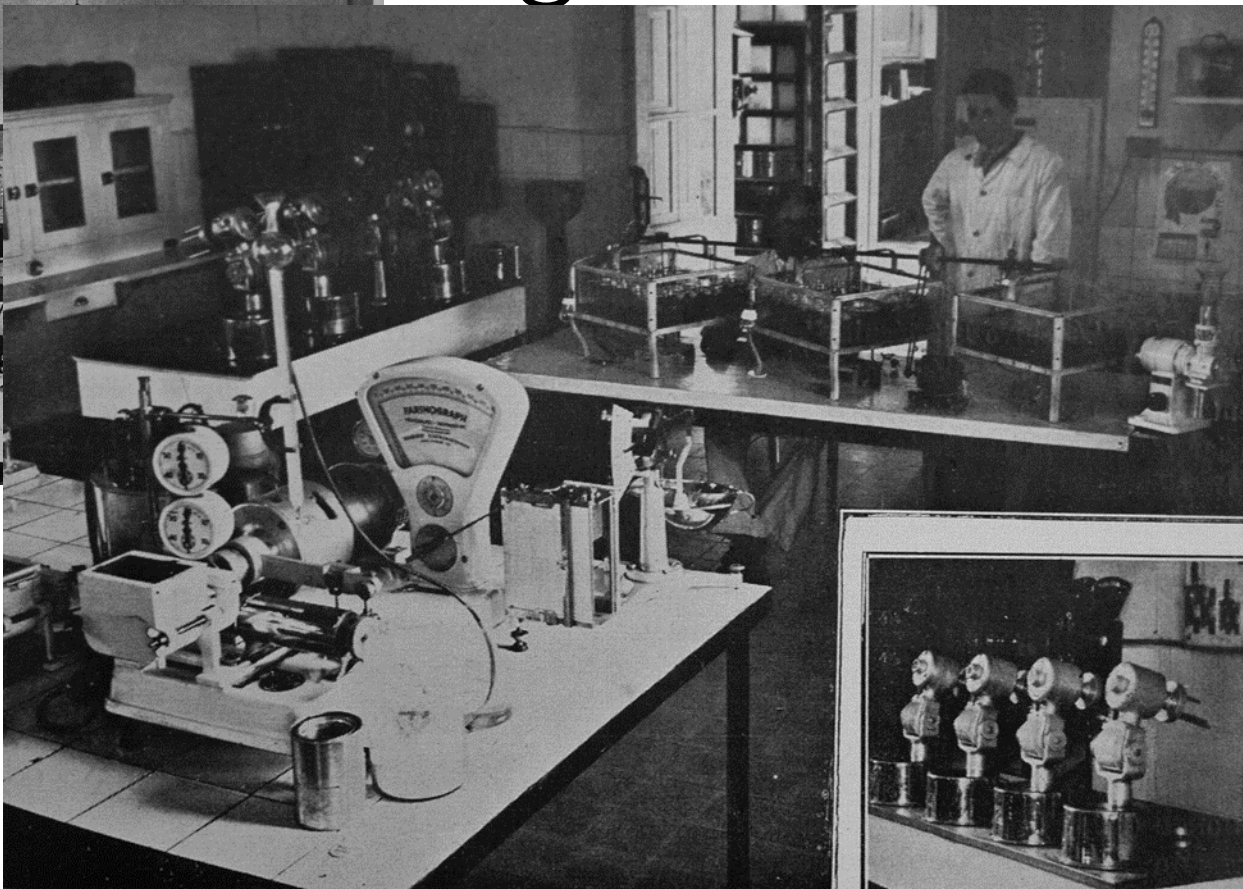
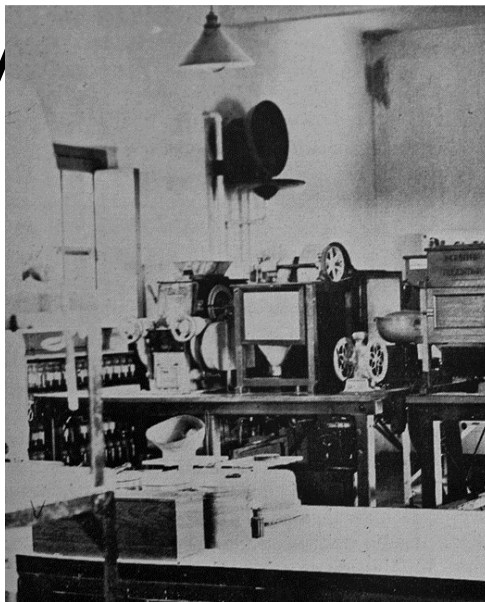
* <http://www.fao.org/faostat>

Uruguay

- People: 3.4 in 7600 millions = 0.05%
- Wheat: 1:2 vs 691 millions tonnes* = 0.18%
(average 10 years)
- Wheat is the main source of calories
- Important for economy
- We need to export, so we need quality
- # or researchers working on wheat quality (90s): <1

* <http://www.fao.org/faostat>

Program



Wheat Breeding Program

(M.Quincke, R.Verges)

- H
- (P
- Tr
- Sc
- M



rica
ea

– NIR spectrometry

Updating methodology

- Example: Mixolab
- Conclusions: not as good as Alveograph for some characteristics, better for others

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April 2015 | Volume 4 | pages 78–87

Applicability of Mixolab test with local wheat flours

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Abstract



Biotech tools (P.Silva)

- Not always effective
- We decided to explore **genomic selection**

Genomic selection

Training population

Phenotyping: quality characterization

Genotyping: many untargeted markers

Prediction model

Validation population

Phenotyping: quality characterization

Genotyping: many untargeted markers

Biotech tools (P.Silva)

- Not always effective
- We decided to explore **genomic selection**
- Collaboration with
 - CIMMYT
 - Universidad de la República (B.Lado)
 - University of Wisconsin (L.Gutiérrez)
- Feasibility proved (paper under revision)

Genetic + Environmental

- Small growing region → “year” = b

- Several approaches
 - Regional approach

- Integration with national rese

CIMMYT (i)

BIOINTA 1000

BIOINTA 1001

BIOINTA 1002

BIOINTA 1004

Embrapa 42

CD 104

IPR 85

Ônix

BRS 208

BRS Guabiju

BRS Guamirim

PANDORA - INIA

QP3065-01

Kronstad F04

Tollocan F05

KABY//2*ALUBUC/BAYA

ALTAR 84/AE.

SQUARROSA (TAUS)//OCI ...

Itapua 40 - Obligado

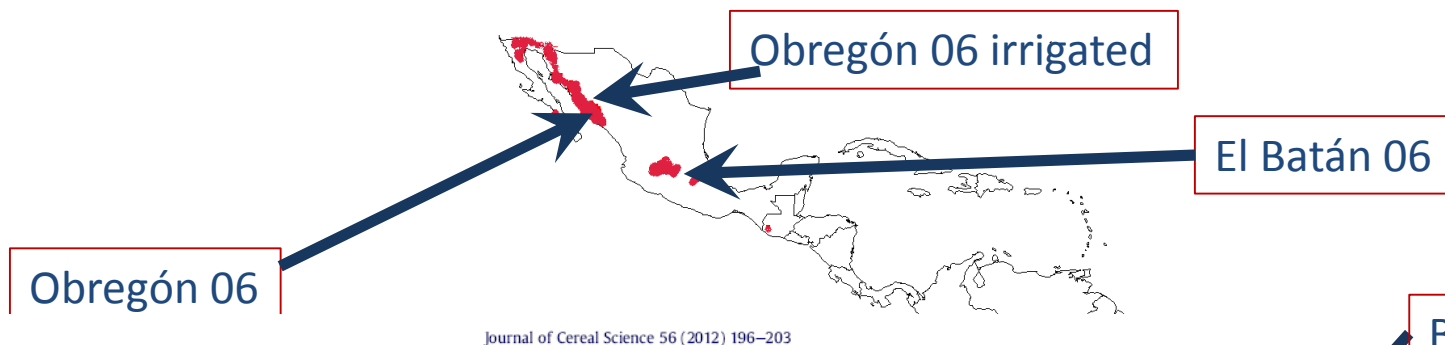
Itapua 50 - Amistad

Itapua 65 - Don Valerio

IAN 10 - Don Arte

INIA Churrinche

INIA Tero



Contents lists available at SciVerse ScienceDirect

Journal of Cereal Science

journal homepage: www.elsevier.com/locate/jcs



Influence of cultivar and environment on quality of Latin American wheats

Daniel Vázquez^{a,*}, Andrés G. Berger^a, Martha Cuniberti^b, Carlos Bainotti^b, Martha Zavariz de Miranda^c, Pedro Luiz Scheeren^c, Claudio Jobet^d, Javier Zúñiga^d, Graciela Cabrera^e, Rubén Verges^a, Roberto Javier Peña^f

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Brasilia 07

Londrina 07

Yhovy 07

Passo Fundo 07

IA 07

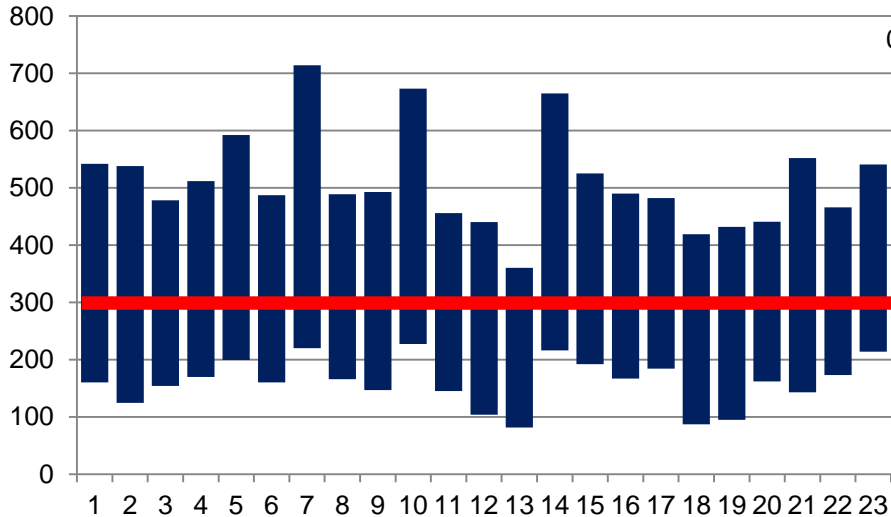
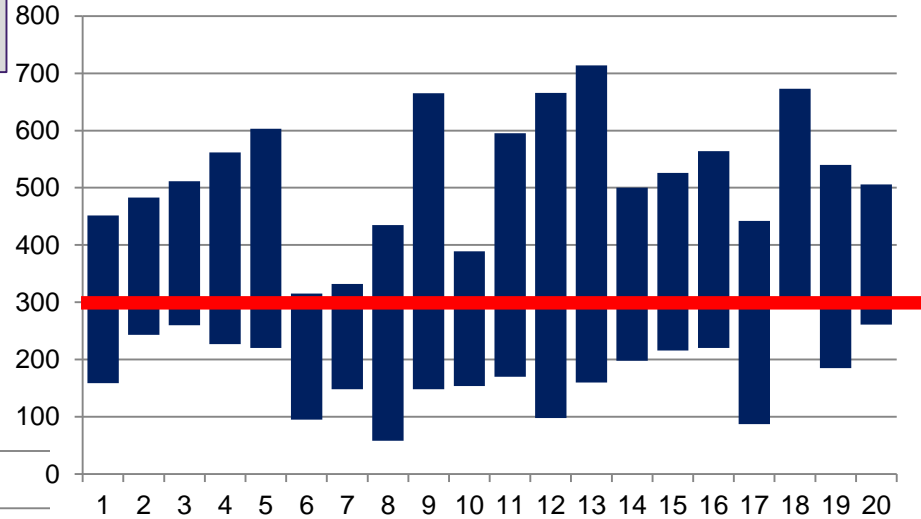
Young 07

Estanzuela 07

Environments

Alveogram W

$300 \text{ jx}10^{-4}$

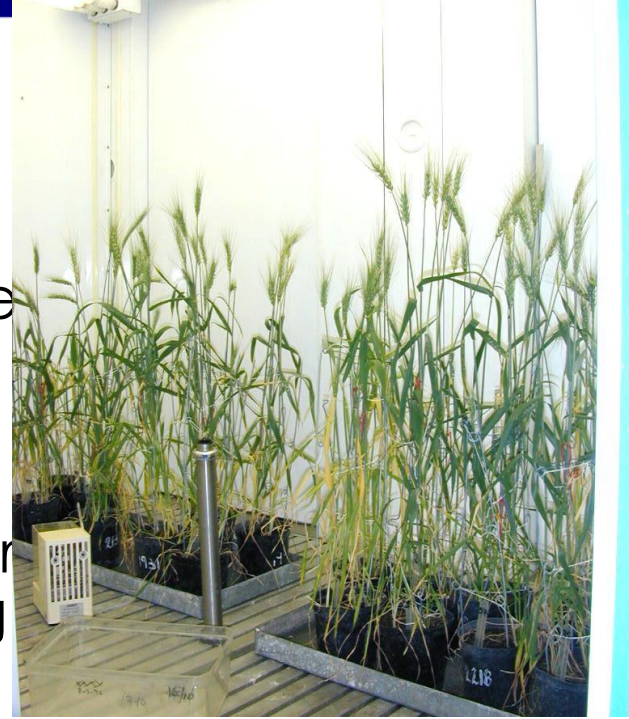


$300 \text{ jx}10^{-4}$

Genotypes

G + E + GxE effects

- Small growing región → “year” bigger
- Several approaches
 - Regional approach
 - Integration with national research
CIMMYT (R.J)
 - Specific approach
 - Example of an abiotic stress: heat
Ecophysiologicalist included quality aspects
Identification of cultivares more stable to heat



Models for N intake

- Ecophysiological (A.Berger):
included “protein content” to yield model

International Crop Modelling Symposium **iCROP2016** 15-17 March 2016, Berlin

MODELING WHEAT GRAIN YIELD AND PROTEIN CONTENT WITH PYG MODEL.

Berger, A.G.¹ – Vazquez, D.¹

¹ Rainfed Crops, INIA La Estanzuela, Ruta 50km 11 Colonia UY, aberger@inia.org.uy

Introduction

Wheat grain yield has increased constantly over time due to management and genetic improvement accompanied in some cases with high risk of reductions in grain protein content (GPC) and baking quality. This reduction in GPC may result from the imbalance

TOO MUCH

Interaction with diseases

- Relevant for Uruguayan conditions (rain: 1200mm/year)
- Leaf diseases affect quality (S.Germán):
 - Negative correlation of incidence of leaf rust with:
 - Grain size
 - Protein content
- Fusarium is a big issue (M.Díaz, S)
 - Lower yield
 - Mycotoxins
 - Very poor baking quality



Beyond INIA: Wheat Board

- Mesa Nacional de Trigo (“Wheat board”): coordination among academia, government and private sector
- Several projects to promote research and/or exports
- Example: UruTrigo (UruWheat) **ANII**
 - Characterisation of genotypes by DON production
 - Characterisation of genotypes by baking strength
 - Improve harvest survey
 - Extension activities

Chemical composition

Wheat proteins



- Grant from ANII to perform SE-HPLC with SLU
(E.Johansson, M.Prieto-Linde)
- RESULTS
 - Genotypes were grouped according to their differential response to N (paper under edition)
 - GxE effects: wait to IGW presentation on Friday

Pentosans

- Laboratory of Carbohydrates and Glycoconjugates,
Universidad de la República

(Silvia Soule, Lucía Garófalo)

Industrial Crops and Products 34 (2011) 1327–1331

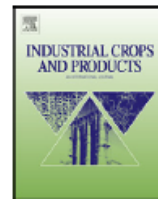
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Contents lists available at ScienceDirect

Industrial Crops and Products

journal homepage: www.elsevier.com/locate/indcrop



- F

Wheat flour non-starch polysaccharides and their effect on dough rheological properties

- T

L. Garófalo^a, D. Vazquez^b, F. Ferreira^a, S. Soule^{a,*}

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Nutrition

Nutrition (M.Elichalt, M.Russo)

- First step: demythification (“bread is bad”)

Rev Chil Nutr Vol. 44, N°1, 2017

Fortificación de harina de trigo con ácido fólico y hierro en Uruguay; implicancias en la nutrición

Fortification of wheat flour with folic acid and iron in Uruguay; implications for nutrition

ABSTRACT

This study assessed folic acid (FA) and iron (Fe) content in flour fortified according to the levels regulated by law, and estimate

Unive

Lípidos, sodio y fibra dietética en harina de trigo y pan artesanal en Uruguay: aporte nutricional según recomendaciones para distintos grupos de población

Lipids, sodium and dietary fiber in wheat flour and artisan bread in Uruguay: nutritional intake according to the recommendations for different population groups

ABSTRACT

This research assessed the proportion of whole-wheat flour in whole-wheat bread relative to the level mandated by law, as well as the content of lipids (Lip) and sodium (Na) in French bread

Marta Elichalt (1)
Mónica Russo (1)
Daniel Vázquez (2)
Gabriela Suburú (3)
Hugo Tihista (4)
Marcela Godíño (5)

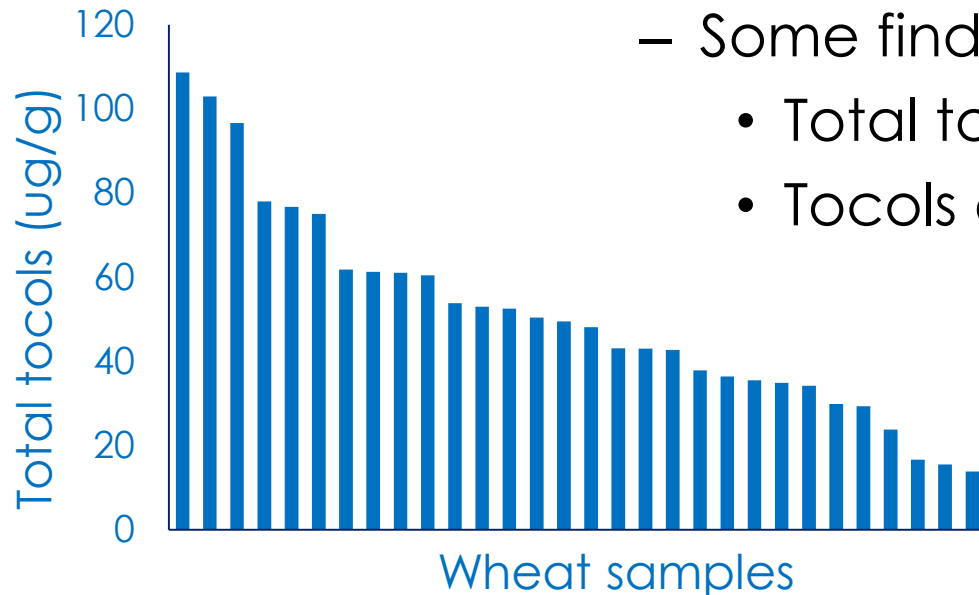
(1) Escuela de Nutrición, Universidad de la República Oriental del Uruguay
(2) Instituto Nacional de Investigación Agropecuaria, La Estanzuela, Uruguay

Nutrition (M.Elichalt, M.Russo)

- First step: demythification (“bread is bad”)
- Nutritional and bioactive compounds characterization

– Some findings:

- Total tocols differences up to 10x
- Tocols and lipids highly correlated



In summary...

"Deserve your dreams"
Getúlio Paz



TRANSLATION



"Be proactive"

Cereal chemistry research in a small country: strategies to move on

Paula Silva

Martha Díaz

Marta Cuniberti

Martín Quincke

Ruben Verges

Silvia Soule

Lucía Garófalo

Eva Johansson

Daniela Ramallo

Mónica Russo

Pierina Clérici

Carlos Bainotti

Betina Lado

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Claudio Jobet

Andrea Balzani

Marta Elichalt

Silvia Germán

Marina Castro

Andrés Berger

Patricia González

Pedro Luis Scheeren

Natalia Calistro

Silvia Pereyra

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MUCHAS GRACIAS

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