ITEMS FROM BRAZIL

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Wheat in Brazil – 2008 crop year.

Eduardo Caierão.

In the 2008 crop year, Brazilian wheat production was about 6 x 10^6 tons (Conab 2009), which is enough to supply only 50% of the domestic demand. This deficit in production makes Brazil one of the world's largest wheat importers. The south region, comprised of the states of Rio Grande do Sul, Santa Catarina, and Paraná, accounts for 95% of the national production. Nonetheless, due to the characteristics of the cultivation system utilized, average grain yield is not the highest in the country. The best figures are observed in the southeast region, where some irrigated areas bring the average up (Table 1).

Table 1. Cultivated area, total production, and grain yield of wheat in Brazil in 2008 (Source: CONAB 2009).

Region	Area (ha x 1,000)	Production (t x 1,000)	Grain yield (kg/ha)
North	—	—	—
Northeast	—	—	—
Central-west	68.2	167.0	2,449.0
Southeast	100.0	265.1	2,654.0
South	2,256.0	5,598.1	2,482.0
Brazil	**2,424.1**	**6,030.8**	**2,488.0**

In 2008, the area planted to wheat was 31% larger than that of the previous crop year. Furthermore, total production and average grain yield/hectare achieved in 2008 were 47% and 12% larger than those of 2007, respectively.

In 2009, the wheat supply in Brazil will be turbulent. The 2008 year crop in Argentina, on which Brazil is highly dependant, had significant losses due to drought, which caused a reduction of about 8 x 10^6 tons in total production. Thus, supply in Brazil will probably not be enough to satisfy the demand, and Brazilian mills might have to procure wheat in the American and European markets.

Reference.

CONAB. 2009. Companhia Nacional de Abastecimento. Central de Informações Agropecuárias/Grãos/Trigo. Disponível em: http://www.conab.gov.br/conabweb/index.php?PAG=131.

Qualitative evolution of Brazilian wheat.

Eduardo Caierão, Pedro Luiz Scheeren, and Márcio Sóe Silva.

The quality profile of Brazilian wheat varies according to the region where it is produced. The southern region is characterized by the cultivation of soft wheat cultivars, and the south-central and central regions are marked by the production of bread wheat. Although this trend is kept in the quality profile of newly released wheat cultivars, the number of cultivars and the magnitude of gluten strength have increased substantially, regardless of cultivation region.

This qualitative evolution has been achieved thanks to research efforts, especially in the genetic improvement field, which is responsible for the triumph over severe biotic and abiotic stresses. In southern Brazil, for example, the greatest obstacle is the high rainfall during harvest months, which favors preharvest sprouting, leaf rust, and Fusarium head blight. In the south-central and central regions, excessive heat, water deficiency, and wheat blast (*Pyricularia grisea*) are the main limiting factors.

For sake of illustration of the challenges that must be overcome by wheat improvement programs in southern Brazil, the Canadian consultant Samborski, during a visit to EMBRAPA in the 1970s said that in Rio Grande do Sul State

"wheat is grown against God's will". In this report, three surveys that represent the evolution in the quality profile of Brazilian wheat for gluten strength will be presented.

Survey 1. In 2008, the J. Macêdo Mill, through its consultant Reino Pecala Rae, published the profile of gluten strength (W) for the six most planted cultivars in the state of Paraná in 1998–99 and 2004–06. In the 1998–99 period, the six most planted cultivars represented 75.3% of the total cultivated area and had a weighted mean W value of 293 × 10^{-4}J. In the 2004–06 period, another six cultivars took 76.6% of the area and the weighted mean of gluten strength was 343 × 10^{-4}J (Table 2). The absolute difference in W between assessment periods was 50 points.

Table 2. Gluten strength of the six most cultivated cultivars in Paraná State in 1998–99 and 2004–06 (% = cultivated area; W = gluten strangth; Source: J. Macêdo Mill, 2008).

1998–99			2004–06		
Cultivar	**%**	**W**	**Cultivar**	**%**	**W**
OR 1	19.1	280	CD104	30.0	364
Iapar 53	15.8	306	BRS 208	16.5	275
BR 18	14.2	324	BRX 220	16.0	340
Ocepar 16	10.4	266	IPR 85	6.5	365
Ocepar 22	9.8	271	CD 111	4.6	500
Ocepar 21	6.0	309	Supera	3.0	234
Total	75.3	293	Total	76.6	343

Survey 2. Apassul is the Seed Producers Association of the Rio Grande do Sul state and publishes yearly the percentage of wheat available for planting according to the certification and inspection system. In a survey for the 2003–07 period, the percent area planted to cultivars with gluten strength below 180 × 10^{-4}J dropped consistently, reaching 45% in 2007. On the other hand, the percentage of available seed with gluten strength above 180 × 10^{-4}J has increased, reaching 55% in 2007 (Fig. 1).

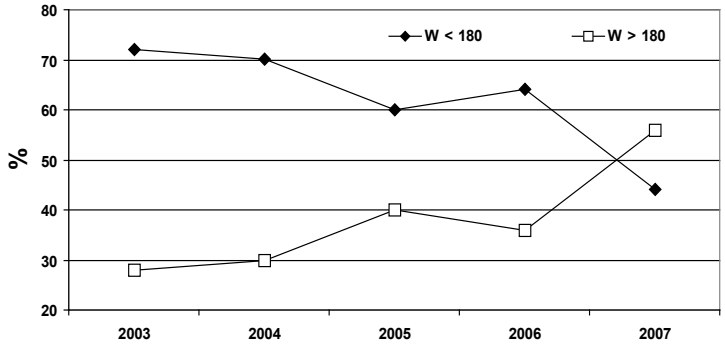

Fig. 1. Evolution of the percent seed availability for the 10 most planted wheat cultivars in crop years 2003 through 2007 in Rio Grande do Sul state of Brazil according to Gluten Strength (W × 10^{-4}J). Source: Apassul, 2008.

Although these data are not scientific, the results observed are at commercial scale and indicate a trend in the qualitative evolution of wheat in the state of Rio Grande do Sul, which is usually considered to be of too low quality for bread. The continuous effort by Embrapa towards wheat improvement, together with the support of other public and private institutions such as Fundacep, OR Seeds, Fepagro, and Coodetec, have contributed to the establishment of this panorama. However, if this trend is lined up with the domestic demand (70% bread wheat, strong gluten and 30% soft wheat, weak gluten), the availability of weak wheat, suitable for biscuit production, probably will soon become limited. Considering this situation, Embrapa has kept a partnership with some biscuit companies, anticipating possible gaps in the supply of weak wheat with homogeneity and identity.

Survey 3. The third survey was performed by the J. Macêdo Mill in 1998–99 and 2004–06. In this study, the gluten strength of samples received by the mill from Brazil's Rio Grande do Sul and Paraná states and Argentina were assessed. While the percentage of samples with gluten strength above 250 × 10^{-4} J increased for wheats of Brazilian origin (from 0 to 10% in Rio Grande do Sul and from 53 to 57% in Paraná, they decreased for wheats of Argentinian origin (from 69 to 31%; Fig. 2, p. 44).

The percentage of samples with gluten strength below 200 × 10^{-4}J also attests to the qualitative evolution towards stronger wheats in Brazil. In Rio Grand do Sul, the percentage dropped from 95% to 71% and, in Paraná, from 18% to 8%. In Argentina, the percentage of soft wheats increased from 4% to 33%. This decrease in the number of strong wheat samples received by the J. Macêdo Mill is due to the introduction of Baguette wheat, featuring high grain yield potential with lower gluten strength, in Argentina.

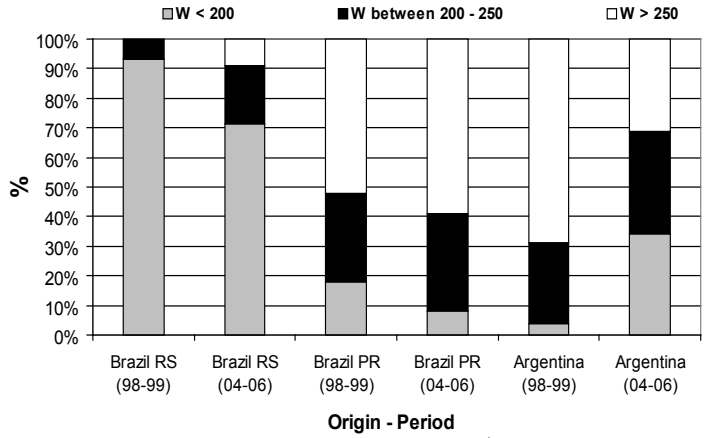

Fig. 2. Evolution of gluten strength ($W \times 10^{-4}J$) in samples received by the J. Macêdo Mill in Brazil, coming from Argentina and Brazil (Rio Grande du Sul (RS) and Paraná (PR) States) in 1998–99 and 2004–06 (Source: J. Macêdo Mill, 2007).

The quality of Brazilian wheat has significantly increased in the last few years. Nevertheless, cultivar mixtures and the varying features of Brazilian wheats is still a challenge that should be overcome in order to increase the value of this cereal.

Embrapa's share in the Brazilian wheat seed market (2000–08).

Eduardo Caierão, Márcio Sóe Silva, and Pedro Luiz Scheeren.

Since its founding in the mid-1970s, Embrapa has worked on wheat genetic improvement, aiming at developing more and more productive cultivars with better tolerance/resistance to biotic and abiotic stresses, aligned with the quality profile demanded by industry and consumers. In almost 40 years of existence, more than 100 cultivars have been made available to farmers, many of which have had a remarkable importance in the recent history of the Brazilian wheat crop and were the most grown cultivars in their time. For example, in the state of Rio Grande do Sul, the most grown cultivars were CNT 10 (1982), CNT 8 (1985–87), Wheat BR 23 (1990–94), Embrapa 16 (1995–98), BRS 49 (2000), and BRS 179 (2002–03). The genealogy of the cultivars released during these years that became market leaders is described in Table 3.

Table 3. The genealogy of Embrapa cultivars that became market leaders in the Brazilian state of Rio Grande do Sul.

Cultivar	Year	Pedigree
CNT 10	1982	IAS 46/IAS 49//IAS 46/Tokai 66
CNT 8	1985–87	IAS 20/ND 81
Wheat BR 23*	1990–94	Corre Caminos/Alondra Sib/3/IAS 54-20/Cotiporã//CNT 8
Embrapa 16	1995–98	Hulha Negra/CNT 7//Amigo/CNT 7
BRS 49	2000	BR 35/PF 83619//PF 858/PF 8550
BRS 179	2002–03	BR 35/PF 8596/3/PF 772003*2/PF 813//F 83899

Table 4. Participation of public and private institutions in the wheat seed market (%) in the Brazilian state of Rio Grande do Sul from 2002 to 2008.

Breeder	Profile	2002	2003	2004	2005	2006	2007	2008
Coodetec	Public/Private	1	1.5	4	5	4	3	5
Embrapa	Public	35	45	44	40	23	11	14
Fepagro	Public	1	0.5	0	1	0	0	0
Fundacep	Public/Private	48	37	23	18	33	37	48
OR Seeds	Private	14	16	27	35	40	47	32
Other	—	1	0	2	1	0	2	1
Totals	Public	36	45.5	44	41	23	11	14
	Public/Private	49	38.5	27	23	37	40	53
	Private	14	16	27	35	40	47	32
	Others	1	0	2	1	0	2	1

Historically, Embrapa has played a significant role in the Brazilian wheat seed market, whether for the market share it has held or for setting the standards for the market as a whole (in economic and technical aspects). Beginning in 1997 with the implementation of the Cultivar Protection Law for the wheat crop, other plant-improvement companies have grown, especially because of the possibility of charging royalties for marketed seed and because of the importance of wheat in Brazil. The wheat seed market shares in Brazil, for the states of Rio Grande do Sul and Paraná, are presented and the aggregation, according to the company profile (public or private) (Table 4 and Table 5, p. 45).

Table 5. Participation of public and private institutions in the wheat seed market (%) in the Brazilian state of Paraná from 2000 to 2008.

Breeder	Profile	2000	2001	2002	2003	2004	2005	2006	2007	2008
Coodetec	Public/Private	14	14	26	28	31	46	41	34	35
Embrapa	Public	23	27	24	16	22	23	33	44	48
Iapar	Public	38	37	30	30	27	18	10	8	8
OR Seeds	Private	21	14	17	23	18	13	15	13	6
Other	—	4	8	3	3	2	0	1	1	2
Totals	Public	61	64	54	46	49	41	43	52	56
	Public/Private	14	14	26	28	31	46	41	34	35
	Private	21	14	17	23	18	13	15	13	5
	Others	4	8	3	3	2	0	1	1	2

In Rio Grande do Sul, Embrapa was the market leader in 2003, 2004, and 2005, but its participation has decreased drastically, down to 14% of the market share in 2008. From 2005 to 2008, Fundacep increased its participation, growing from 18% to 48%. The participation of public companies was once larger, especially in 2002, 2003, and 2004. In 2007, an equilibrium between the participation of public and private companies was achieved (Table 4, p. 44).

In Paraná, the current participation of Embrapa in the wheat seed market is highly significant, having reached its highest rate in nearly 10 years (55%). On the other hand, the participation of Iapar (a traditional breeder in the state) has abruptly dropped since 2000, reaching only 7% in 2008. Coodetec, which led the market in 2004, 2005, and 2006, also has shown a reduction in its participation in the last 2 years. The participation of OR Seeds in the Paraná market is rather modest and achieved its highest rate (23%) in 2003 (Table 5).

ITEMS FROM THE PEOPLES REPUBLIC OF CHINA

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Characterization of low-molecular-weight glutenin subunit Glu-B3 genes and the development of STS markers in common wheat.

To characterize the LMW-GS genes at the *Glu-B3* locus, gene-specific PCR primers were designed to amplify eight near-isogenic lines and Cheyenne with different *Glu-B3* alleles (*a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, and *i*) defined by protein electrophoretic mobility. The complete coding regions of four *Glu-B3* genes with the complete coding sequence were obtained and designated as *GluB3-1*, *GluB3-2*, *GluB3-3*, and *GluB3-4*. Ten allele-specific PCR markers designed from SNPs present in the sequenced variants discriminated the *Glu-B3* proteins of electrophoretic mobility alleles *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, and *i*. These markers were validated on 161 wheat cultivars and advanced lines with different *Glu-B3* alleles, thus confirming that the markers can be used in marker-assisted breeding for wheat grain processing quality.

Characterization of novel LMW-GS genes at the Glu-D3 locus on chromosome 1D in Aegilops tauschii.

The objectives of this study were to clarify the relationship between LMW-GS *Glu-D3* gene of *Ae. tauschii* registered in GenBank and the six *Glu-D3* genes, including 12 allelic variants of common wheat characterized in our previous studies, and identify novel *Glu-D3* genes and haplotypes from *Ae. tauschii* using gene-specific PCR amplification. By searching