Brazilian Association of Vegetable Oil Industries

São Paulo, Brazil Ofício nº 38

October 28, 2010

To: European Comission

Ref.: Public Consultation by the European Commission on the Indirect Land Use Change (ILUC)

Dear Sir,

In answer to the consultation regarding the Impacts of Biofuels on Indirect Land Use Changes (ILUC), the Brazilian Vegetable Oil Industry Association – ABIOVE – would like to provide the following comments for use in the discussions on this important point of European Directives 2009/28/EC and 2009/30/EC.

I. Introduction

First of all, an introduction to ABIOVE. This Association represents nine companies that, together, are responsible for the processing and exportation of 72% of Brazil's soybeans. In the most recent crop, the soybean complex produced about 68 million tons and was responsible for about 10% of Brazil's total exports. In addition, one of the Association's members is one of the country's largest biodiesel producers. Because of these facts, ABIOVE has significant expertise in the domestic productive chain and its relationship with environmental matters. Far-reaching actions are being undertaken to further improve the socio-environmental sustainability of Brazilian soybeans, including:

1. Soy Moratorium in the Amazon Biome

Since July 2006, ABIOVE, ANEC (the National Grain Exporters Association) and their corporate members signed a commitment, called the Soy Moratorium, not to acquire soybeans from areas in the Amazon Biome that were deforested after that date.

The Moratorium initiative was undertaken by the sector in response to the demand for greater information and demands for guaranteeing the acquisition of a sustainable product. With an initial timeframe of two years, this initiative has been renewed annually and, today, is a reference for other sectors who wish to implement similar actions.

We have now monitored three crops in the Biome's producing states in order to identify the properties that planted soybeans in areas deforested after July 2006. Based on this information, production from those properties was rejected and financing for the following crop blocked.

Planning is carried out by the Soy Work Group (GTS), made up of the following institutions: ABIOVE, ANEC, their corporate members, civil society organizations (International Conservation, Greenpeace, IPAM, TNC and WWF-Brasil) and the Ministry of the Environment (MMA).

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The work, coordinated by ABIOVE, is carried out by a multidiscipline technical team that involves the National Land Research Institute (INPE), field technicians from the corporate members, civil society organizations, Globalsat Monitoramento Agrícola (a company that field surveys) and ABIOVE employees.

In summary, the Soy Moratorium has been successful in carrying out all the objectives established in 2006:

- Soybean participation in the Biome's deforestation:
  - In the 2007 crop, no recently deforested areas were found to have planted soybeans.
  - In the 2008 and 2009 crops, newly deforested areas planted with soybeans represented just 0.25% of the total deforested area in the monitored towns in the states of Mato Grosso, Pará and Rondônia, which represent 97% of the soybean acreage in the Biome[1]. Considering the total deforested area in all of the states in the Biome, the percentage of soybean acreage is even lower.
- Information regarding the causes of deforestation in the Biome:
  - Through documentation and its full availability to the public, the Moratorium generated information that allows a better understanding of the causes of deforestation in native areas.
  - Because soybean participation was insignificant in the forest degradation process, the Brazilian Government and other institutions were able to promote more efficient monitoring and control actions.
- Coordination with the public sector:
  The MMA supported the GTS in the discussions regarding the steps to be taken and the preparation of actions related to the sustainability of the soybean productive chain in Brazil.
- Producer awareness:
  Actions are being developed to work, together with the rural producer, on steps that can meet society's demand for ever-more sustainable soybeans. These actions include the publication of a leaflet with good agricultural practices, as well as technical assistance and rural extension.

2. Program to eradicate degrading working conditions

Along the same lines as the Moratorium, the companies publicly declared that they will not acquire the soybean production of properties that have degrading working conditions[2]. Based on official declarations by the Ministry of Labour, supported by the International Labour Organization (ILO) and civil society organizations, the companies identified all non-compliance properties and immediately rejected the acquisition of their production.

[1] ABIOVE (2010a).
[2] ABIOVE (2006).

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3. Soja Plus Program for Rural Property Management

In 2010, ABIOVE, in partnership with rural soybean producers represented by the Soybean Producers Association (APROSOJA), with ANEC and the Institute for Responsible Agribusiness (ARES), launched the Management Program for Brazilian Soybean Properties – the Soja Plus Program[3].

Another big sustainability action undertaken by the productive chain, this Program's objective is to introduce in the properties best socio-environmental practices, which should guarantee adequate working conditions and the conservation of natural resources: water, land and native vegetation. In addition, the Program will orient producers on how they can comply with Brazilian legal requirements on socio-environmental matters. These two elements, best socio-environmental practices and complying with legislation, make up a set of very strict requirements in an inclusive and voluntary process. The Program will emphasize continuous improvements in sustainability indices, and it will be possible to guarantee that the producer, over time, can implement and refine all processes and practices related to soybean production.

Furthermore, given the strong partnership within the productive chain, it will be possible to execute actions at a regional level, such as the work on hydrographic micro-drainage basins. This will increase the coordination and harmonization of sustainability practices, i.e., their efficiency.

At the end of the process, the producer will be ready to receive Soja Plus certification.

II. Comments

In view of the actions being implemented by the soybean productive chain in Brazil, the world's second largest producer and largest exporter of this oilseed, ABIOVE is taking the liberty of making these comments regarding the reports that will be submitted by the European Commission to the European Parliament and Council, as follows:

a) Reviewing indirect land use change impacts on the greenhouse gas emissions of biofuels;
b) Addressing ways to minimise that impact.

For brevity when citing the works on this theme that have been made available by the European Commission, the reports consulted will be numbered as follows:

Work (1): Global trade and environmental impact study of the EU biofuels mandate.
Work (2): Impacts of the EU biofuel target on agricultural markets and land use: a comparative modelling assessment.
Work (3): Land use change impacts on greenhouse gas emissions from biofuels and bioliquids – literature review.
Work (4): Indirect land use change from increased biofuels demand – comparison of models and results for marginal biofuels production from different feedstocks.

[3] ABIOVE (2010b).

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1) <u>Do you consider that the analytical work referred to above, and/or other analytical work in this field, provides a good basis for determining how significant is the indirect land use change resulting from the production of biofuels?</u>

The analytical work on the Indirect Land Use Change impacts (ILUC), requested by the European Commission, gives a sufficiently ample panorama on the methodologies currently under discussion. The following points on the possibility of measuring ILUC by the proposed methodologies should be emphasised:

<u>High uncertainty of the models</u>

Work (1) cites the report developed by the UNITED STATES (2009) *"although there is general consensus on the approach for measuring the direct effects of increased biofuels production, there is disagreement about assumptions and assessment methods for estimating the indirect effects of global land-use change"*. These conclusions are based on the great variation in the results obtained in the works reviewed, a consequence of the different assumptions made regarding the raw material used and the criteria for allocating co-products, among other reasons.

Work (3) exhaustively explores the advantages and disadvantages of using the different models: partial balance model (EP) and computable general model (EGC), with the function of estimating ILUC. From the conclusions in Item 6.2.8 (pg. 68-69), the two economic models omit important variables that favour the use of biofuels.

We draw your attention to the big impact of the change in just some parameters on the final results of the simulations, as is the case of elasticity-price of yield growth:

- "This assessment of the sensitivity of the results to assumptions about yield growth suggests that if EU biofuel policies induce much faster yield growth for the major feedstocks, then the pressure on land could be reduced or even reversed." (2, pg. 66).
- "Sensitivity exercises showed that different assumptions about the response of yields to demand have big impacts on the results, with higher-response assumptions leading to reductions of 27-80% in land conversion or carbon stock loss as compared to the results with studies' central assumptions." (3, pg. 5).

Another sensitive point is: *"Some studies assume that converted land will have a lower yield than already cultivated land. Depending on the study, the removal of this assumption would reduce the amount of land needing to be converted by approximately 17% to 67%. The literature contained no empirical data in support of this assumption, and there is good reason for thinking that even the smallest of the estimated effects is too large."* (3, pg. 6).

Using this assumption, for example, underestimates the yield of soybean crops in various recently planted areas in Brazil, as their yield is similar to that in traditional areas. According to calculations by the National Geographic and Statistical Institute from data on planted acreage and yields in the micro-regions (IBGE, 2009), it is possible to verify that **there is no significant statistical difference in soybean yield between traditional soybean productive areas and recent areas (Attachment I)**.

The explanation for this is that, initially, the yield from new areas is lower than that from traditional areas because of the need to make soil corrections for oilseed plantings. However, countries such as

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Brazil have adequate technology to adapt soybeans to new areas and their average yield is equal to, and in some regions superior to, traditional areas, even in the short term**.**

Overestimating ILUC on soy biodiesel

The calculations estimating ILUC were based on assumptions of the quantity of each biofuel that will be used in a given period. In the case of biodiesel, demand scenarios were made for each raw material used in its production. From these values, the need for new agricultural land was estimated and, from that, the effects on current land uses (crops, pastures, native areas and others), shaping the so-called Land Use Changes (Direct and Indirect).

Following that, a standard value was attributed to the CO_2-eq. stock for each type of current and future use, which was multiplied by the amount of additional land for each class. That provided total CO_2-eq. emission which, divided by the production consumed by the corresponding biofuel (generally utilised in energetic units), resulted in a CO_2-eq. emission factor per unit (of energy) for that biofuel.

However, this reasoning is based on the assumption that **the increase in raw material demand will be sufficient to increase planted acreage**. Given that soybean oil represents around 31%[4] of total soybean complex income, any increase in soybean production will occur only if there is an increase in the demand for proteic meal for the production of feed for the meat and protein industries.

Otherwise, i.e., without this demand from the meat industry, meal prices would fall on the international market, with the same effect on soybean prices. In this case, no incentive for expanding soybean acreage would exist, but there would be an incentive for expanding the oilseeds with high oil content.

Since soybean oil is a by-product of meal production, its use as a biodiesel will depend on its price and its quality, compared to other vegetable oil and animal fat sources. **The small capacity for the price of soybean oil to influence the oilseed's planted acreage implies that the estimated ILUC for soybean biodiesel is not significant**.

Difficulty in incorporating recent institutional changes in the models

But the greatest difficulty in the simulation and long-term estimate models is incorporating those institutional changes whose effects cannot be perceived in statistical analyses since they have occurred recently and have not yet significantly altered the mathematical tendencies of historic series.

Such is the case of the Brazilian government's more effective control over deforestation of native areas in the Amazon Biome. As the fall in deforestation is recent (27,800 km^2 in 2004 to 7,500km^2 in 2009[5]), the works were based on past data that no longer reflects reality, thereby hurting biofuels made from raw materials whose production grew in the past concomitantly with the conversion of native areas.

Dealing with global bases makes for even greater difficulties. Most of the models use bases related to the years before the reported falls in deforestation (1, pg. 27; 2, pg. 177). In the case of Work (4), the

[4] In 2009, global production of soybean meal and oil were 153.8 and 36.0 million tons respectively, and prices were US$413/ton and US$781/ton respectively (Oil World, 2010).
[5] INPE (2010).

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problems related to land use data led the authors to opt for updating version 6 (dated 2001) of GTAP, instead of version 7 (dated 2004).

The following comment makes this difference in information evident: *"Land use data play an essential part in land use change modelling. The available data-sets give markedly different results – for example, estimates of global cultivated land in 2000 ranged from 1.2 billion to 2.0 billion hectares. There is no consensus about which data-set is best for work of the type covered here."* (3, pg. 5).

Variations of this size have a strong impact on the models' results. The difficulty in modelling crop rotation, for example, is a serious problem found in the models. *"If crop yields increase, less land will be needed. Most of the modelling reviewed assumes a yield increase in the baseline. Its size is rarely clear. High assumptions could reduce the amount of land converted by 15% compared with low assumptions. There is reason to believe that, in the underlying data, increases in cropping intensity (such as multiple crops per year) are misclassified as increases in land use. If so, studies that rely on historic figures for their yield assumptions will tend to use a lower value than they should."* (3, pg. 5).

Commitments with sustainability made by the productive chains

The sector's commitments are another example of changes that should be present in the models. The Soy Moratorium, Soja Plus Program and several other initiatives implemented by the soybean productive chain to meet market demand for a more sustainable product illustrate the big changes occurring in future land use change scenarios.

Brazil's incipient palm productive chain is another example where socio-environmental sustainability requirements are being observed. Under Decree No. 7172, dated May 7, 2010, the Brazilian government approved Agri-Ecological Zoning (ZAE) for palm and the rules for financing production. This Decree was widely approved by the companies and institutions that have an interest in a sustainable palm oil process. Starting with this Decree, palm planting and its financing are restricted only to areas **deforested up to 2007** with adequate soil and climate quality. In addition, the socio-economic conditions of the communities involved should be respected, favouring the generation of jobs and income and spreading best agricultural practices[6].

Tools such as this one are not included in any of the works presented, which without doubt is a big failing in the models because they over-estimate palm's greenhouse gas emissions when presuming that growth in acreage would occur in native areas.

Attributing ILUC to soybean biodiesel is a mistake

Another failure of the models is underestimating the positive effects that biodiesel markets have on the different oilseeds. Given the low oil content in soybeans (about 19%), the increase in vegetable oil demand incentivates other oilseeds that are able to increase the supply of this product more quickly.

In the last 20 years, the increase in demand for vegetable oils (+89.8 million tons) was principally met by palm oil (+42.7 million tons), giving this product a 48% share in the growth of oil supply. Soybean oil has a smaller share, just 28% of the variation in supply (+25.1 million tons), as shown in Table 1.

[6] BRASIL (2010b).

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The situation is inverted when the variation in meal supply is analysed, soybean meal having a 76% share (+103.9 million tons) in the increase in vegetable meal supply (+135.9 million tons).

Table 1 – World production of vegetable meals and oils – 1990/91 to 2009/10
(in thousands of tons)

Product	Meal				Oil			
	1990/91	2009/10	Variation		1990/91	2009/10	Variation	
From	a	b	(b-a)	(b-a)/a	c	d	(d-c)	(d-c)/c
Soybeans	69,229	173,125	103,896	150%	15,765	40,821	25,056	159%
Rapeseed	14,346	33,059	18,713	130%	8,597	21,950	13,353	155%
Cotton	12,000	14,862	2,862	24%	3,709	4,962	1,253	34%
Sunflower	9,088	12,467	3,379	37%	8,087	11,554	3,467	43%
Palm + palm kernel	1,673	6,944	5,271	315%	12,447	55,189	42,742	343%
Others*	6,280	8,054	1,774	28%	7,705	11,663	3,958	51%
Total	**112,616**	**248,511**	**135,895**	**121%**	**56,310**	**146,139**	**89,829**	**160%**

Source: UNITED STATES – PRODUCTION, SUPPLY AND DISTRIBUTION ONLINE.
Prepared by: ABIOVE.
* Other meals are copra and peanut; other oils are coconut, olive and peanut.

These numbers show that the different oilseeds have specialties that are adequate for different market purposes. Soybeans, with their high proteic meal content (81%), will not be produced solely for the biodiesel market. On the contrary, production depends essentially on the demand for feed from the meat industry, especially the poultry and pork markets; oil is a by-product of meal.

The Soy Moratorium, an action with broad reach and transparency, shows that deforestation in the Amazon Biome is related to other economic agents; with soybeans having an insignificant share in the total deforestation for the period 2007-2009 (0.25%). In this same period, soybean production grew over 17% (+10.3 million tons[7]) and biodiesel production grew no less than six-fold (from 404,000m^3 in 2007 to 2,477,000 m^3 in 2010[8]).

As was shown in Works 1 (pg. 56) and 2 (pg. 87), estimating biodiesel production from soybean oil would lower the prices of soybean meal and grain, which would end up also reducing the oilseed's acreage. Therefore, assuming that biodiesel will become an incentive vector for increased soybean production is not valid, though it is valid to assume that this market will be met by other oilseeds, especially palm, canola and sunflower.

Other oilseeds with high oil production potential are receiving an increase in research funds, as is the case with jatropha (*Jatropha curcas L.*), for which the Brazilian Agri-livestock Research Company – EMBRAPA – has a program to evaluate yields according to ideal regional edaphoclimatic conditions[9].

These developments take time to show results; however, in a 5-10 year period, the market should see a significant increase in production, as should also occur with palm and other oilseeds in Brazil.

[7] Companhia Nacional de Abastecimento (National Supply Company) - CONAB (2010).
[8] Agência Nacional do Petróleo (National Petroleum Agency) – ANP (2010).
[9] BRASIL (2010c).

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Finally, the possible effects of ILUC cannot be attributed to a specific production unit (rural property and/or processing industry), which in turn would make mitigation and, consequently, certification for the European market very difficult. Attributing ILUC values to soybeans under these uncertain conditions would become an insurmountable barrier for the units involved as it would be wholly out of their control.

Violation of the World Trade Organization's Agreement on Technical Barriers to Trade

The various oils for biodiesel are highly interchangeable and just this fact implies that it is impossible to attribute ILUC-related greenhouse gas emissions to specific product(s) or region(s). If implemented, this requirement will violate Articles III.1 of the General Agreement on Trade and Tariffs (WTO, 1986)[10] and 2.1 of the Agreement on Technical Barriers to Trade – TBT (WTO, 1994)[11] of the World Trade Organization, especially if implying more favourable conditions for canola and sunflower oils domestically produced by block countries than for oils from the other imported crops.

Furthermore, the Indirect Land Use Impacts resulting from expansion of biofuels lacks legitimacy as they deal with possible effects in third countries (outside the 27 countries that make up the European Union), as well as scientific consensus because there is no regulation for international standardisation related to ILUC.

Conclusions

In ABIOVE's opinion, the methodologies used in Work 1 through Work 4 do not have the capacity for adequately broaching the indirect impacts on land use from biofuel production because, even with sensibility analyses, the data bases do not incorporate important institutional and sectorial aspects.

Thus, using the proposed models will give results that are based on assumptions that do not correspond to the institutional progress on increasing oilseed production without damaging natural resources and with low greenhouse gas emissions. Such values do not correspond to natural, long-term developments and will inadvertently hurt biodiesel production, especially in developing countries.

2) On the basis of the available evidence, do you think that EU action is needed to address indirect land use change?

Biofuels, which have become a news item over the last few years because of their potential to generate jobs, reduce greenhouse gas emissions compared to fossil fuels and increase energy security, are currently dependent on energy importation from politically unstable countries. They are, therefore, a great opportunity for all countries, especially developing countries.

[10] Article III.1 - The contracting parties recognise that internal taxes and other internal charges, and the laws, regulations and requirements affecting internal sales, sale offerings, purchases, transportation, distribution or use of products, and internal quantitative regulations requiring the mixing, processing or use of products in specified amounts or proportions, should not be applied to imported or domestic products so as to afford protection to domestic production.

[11] Article 2.1 - Members shall ensure that, in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favourable than that accorded to like products of national origin and to like products originating in any other country.

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In general, the agrarian question and illegal wood extraction are the principal incentive vectors in the deforestation process (3, pg. 21). The case of the Soy Moratorium, a wide-reaching and transparent action, shows that deforestation in the Amazon Biome is related to other economic agents. Soybeans have an insignificant share in the total – 0.25% in the 2007-2009 period. In the same period, soybean production grew 17% and biodiesel more than six-fold (404,000m^3 in 2007 to 2.477 million m^3 in 2010[12]).

In this scenario, the EU's work to reduce/mitigate a possible ILUC related to energy crops could be highly advantageous if done in the form of economic assistance funds and with scientific cooperation, so that the countries can create and refine institutional tools capable of monitoring and controlling the forest degradation processes, and incentivate orderly agricultural expansion in a sustainable manner, such as studies of Economic-Ecological Zoning.

3) If action is to be taken, and if it is to have the effect of encouraging greater use of some categories of biofuel and/or less use of other categories of biofuel than would otherwise be the case, it would be necessary to identify these categories of biofuel on the basis of the analytical work. As such, do you think it is possible to draw sufficiently reliable conclusions on whether indirect land use change impacts of biofuels vary according to:

- **Feedstock type?**
- **Geographical location?**
- **Land management?**

All vegetable meal and oil markets are interconnected because their uses are interchangeable (human or animal consumption and industrial) and/or through the resources used for their production: land, water, work, capital and technology. Oil World, an internationally recognised authority on the meal and oil markets, annually follows 10 oilseeds, 12 meals and 17 oils and fats, all of which are interrelated.

Actually, classifying biofuels by origin, raw material and/or land management would not eliminate their land use impacts. On the contrary, all the processes tied to agrarian matters, difficulties in monitoring and control, and other problems unrelated to production of raw material for biofuels would continue to exist.

The mere existence of a biofuels market based on obligatory mixtures creates incentives for all products directly related to production and their substitutes.

Therefore it becomes necessary to create **mechanisms for economic and technological cooperation** as the most efficient way to promote sustainable biofuel production. These mechanisms should be evaluated only for direct land use changes (LUC). In addition to the named benefits, these steps would avoid questioning in the World Trade Organization (WTO) on the validity of such measures.

[12] ANP (2010) and EPE (2010).

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4) **Based on your responses to the above questions, what course of action do you think appropriate?**
   - A. **Take no action for the time being, while monitoring impacts including trends in certain key parameters and, if appropriate, proposing corrective action at a later date**
   - B. **Take action by encouraging greater use of some categories of biofuel**
   - C. **Take action by discouraging the use of some categories of biofuel**
   - D. **Take some other form of action**

In view of the above explanations, ABIOVE is in favour of Option D – take some other form of action. The Association, which is very involved with the soybean productive chain and the product's socio-environmental sustainability, understands that the most efficient way of promoting sustainable biofuels is through bilateral, regional or multilateral cooperation agreements.

Such agreements should incorporate means of support for the development of infrastructure and a technical body able to monitor and control the processes that result in the deforestation and degradation of natural resources. **The creation of further trade barriers will not contribute to biofuel sustainability nor to energy security in the countries that use them**.

Additionally, scientific cooperation is fundamental in order to increase crop yields and reduce their socio-environmental impacts. **Such a stance will be capable of** meeting the demand for sustainable products, promoting economic well-being in many countries, especially in developing countries, and **avoiding questions at the WTO**.

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Attachment I

A regression was made by the Ordinary Least Squares method for average soybean yields (in kg per hectare) for Brazil's 178 micro-geographical production regions for the average of the years 2006 to 2008, as a function of whether the micro-region was classified as a "traditional" production area (84 observations) or a "recent" area (94 observations). The following criteria were used to determine the region:

- Traditional (value 0): Micro-region whose average acreage in the 2006-2008 period was greater than or equal to 5,000 hectares;
- Recent (value 1): Micro-region whose acreage met three criteria:
    - Average acreage for the 1996-1998 crops represents less than 0.5% of Brazil's total average acreage in the same period;
    - Average acreage for the 2006-2008 crops represents more than 0.01% of Brazil's total average acreage in the same period;
    - There was an increase in the share of the national total average acreage for the 2006-2008 period compared to that of the national total average acreage for the 1996-1998 period.

The micro-regions that do not fit either of these two categories (380 observations) were excluded from the analysis since they either did not have significant soybean acreage or were in decline.

The regression was made to test the validity of the hypothesis that micro-regions with recent production have a lower yield than traditional ones (hypothesis 0). In this respect, the significance of the coefficient of a dummy variable that assumes the value equal to 0 when the region is classified as traditional and equal to 1 when it is classified as having recent production was tested. The results of the exercise are shown in Table A.1:

Table A.1 – Results of the regression

SUMMARY OF RESULTS

Regression statistics	
Multiple R	0.628
R-square	0.39
R-adjusted square	-0.17
Standard error	337
Observations	178

ANOVA

	Coefficient	*Standard error*	*Stat T*	*Value-P*
Intersection	2,584.73	36.78	70.27	**0.0000**
DUMMY	42.25	50.62	0.83	**0.4050**

As can be observed, the Statistic "T" in the dummy variable was not significant at a significance level of 95%, which makes it possible to reject H0. In other words, there is no significant statistical difference between the yields of traditional regions and those with recent production.

Table A.2 contains the data used for the regression:

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Table A.2 – Soybean producing micro-regions in Brazil

IBGE CODE	NAME	STATE	DUMMY	AVERAGE YIELD 2006-2008 (in kg/hectare)
11007	Vilhena	RO	1	2,944
11008	Colorado do Oeste	RO	1	2,865
14001	Boa Vista	RR	1	2,804
14002	Nordeste de Roraima	RR	1	2,867
15002	Santarém	PA	1	2,681
15017	Paragominas	PA	1	3,113
15022	Conceição do Araguaia	PA	1	3,182
17001	Bico do Papagaio	TO	1	2,557
17002	Araguaína	TO	1	2,544
17003	Miracema do Tocantins	TO	1	2,431
17004	Rio Formoso	TO	1	2,641
17005	Gurupi	TO	1	2,553
17006	Porto Nacional	TO	1	2,370
17007	Jalapão	TO	1	2,508
17008	Dianópolis	TO	1	2,472
21011	Alto Mearim e Grajaú	MA	1	2,731
21013	Baixo Parnaíba Maranhense	MA	1	2,900
21014	Chapadinha	MA	1	2,921
21018	Chapadas do Alto Itapecuru	MA	1	2,360
21019	Porto Franco	MA	1	2,608
21020	Gerais de Balsas	MA	0	2,787
21021	Chapadas das Mangabeiras	MA	1	2,775
22007	Alto Parnaíba Piauiense	PI	1	2,606
22008	Bertolínia	PI	1	2,521
22010	Alto Médio Gurguéia	PI	1	2,613
29001	Barreiras	BA	0	2,672
29003	Santa Maria da Vitória	BA	0	2,671
31001	Unaí	MG	0	2,706
31002	Paracatu	MG	0	2,669
31003	Januária	MG	0	2,133
31006	Pirapora	MG	1	2,628
31017	Ituiutaba	MG	1	2,546
31018	Uberlândia	MG	0	2,676
31019	Patrocínio	MG	1	2,855
31020	Patos de Minas	MG	0	2,705
31021	Frutal	MG	0	2,858
31022	Uberaba	MG	0	2,764

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IBGE CODE	NAME	STATE	DUMMY	AVERAGE YIELD 2006-2008 (in kg/hectare)
31023	Araxá	MG	0	2,786
31042	Piuí	MG	1	2,340
31047	Passos	MG	1	2,375
35003	Votuporanga	SP	0	2,504
35004	São José do Rio Preto	SP	0	2,234
35009	Barretos	SP	0	2,458
35010	São Joaquim da Barra	SP	0	2,801
35011	Ituverava	SP	0	2,713
35012	Franca	SP	0	2,482
35013	Jaboticabal	SP	0	2,272
35014	Ribeirão Preto	SP	0	2,401
35016	Andradina	SP	1	2,712
35017	Araçatuba	SP	1	2,338
35018	Birigui	SP	1	2,910
35022	Avaré	SP	0	2,401
35024	Araraquara	SP	0	2,446
35030	São João da Boa Vista	SP	0	2,753
35036	Presidente Prudente	SP	1	2,402
35039	Assis	SP	0	2,538
35040	Ourinhos	SP	0	2,885
35041	Itapeva	SP	1	2,956
41001	Paranavaí	PR	1	2,230
41002	Umuarama	PR	1	2,555
41003	Cianorte	PR	1	2,360
41004	Goioerê	PR	0	2,767
41005	Campo Mourão	PR	0	2,975
41006	Astorga	PR	1	2,446
41007	Porecatu	PR	0	2,540
41008	Floraí	PR	0	2,685
41009	Maringá	PR	0	2,650
41010	Apucarana	PR	0	2,888
41011	Londrina	PR	0	2,682
41012	Faxinal	PR	1	2,877
41013	Ivaiporã	PR	1	2,865
41014	Assaí	PR	0	2,652
41015	Cornélio Procópio	PR	0	2,622
41016	Jacarezinho	PR	0	2,528
41017	Ibaiti	PR	1	2,802
41018	Wenceslau Braz	PR	1	3,019

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IBGE CODE	NAME	STATE	DUMMY	AVERAGE YIELD 2006-2008 (in kg/hectare)
41019	Telêmaco Borba	PR	0	2,878
41020	Jaguariaíva	PR	1	3,111
41021	Ponta Grossa	PR	0	3,059
41022	Toledo	PR	0	2,692
41023	Cascavel	PR	0	3,013
41024	Foz do Iguaçu	PR	0	2,990
41025	Capanema	PR	0	2,435
41026	Francisco Beltrão	PR	0	2,494
41027	Pato Branco	PR	0	2,549
41028	Pitanga	PR	1	2,843
41029	Guarapuava	PR	0	2,879
41030	Palmas	PR	0	2,636
41031	Prudentópolis	PR	0	2,815
41032	Irati	PR	1	2,683
41033	União da Vitória	PR	1	2,938
41034	São Mateus do Sul	PR	1	2,849
41036	Lapa	PR	1	2,944
41037	Curitiba	PR	1	3,261
41039	Rio Negro	PR	1	3,010
42001	São Miguel do Oeste	SC	1	2,500
42002	Chapecó	SC	0	2,436
42003	Xanxerê	SC	0	2,693
42004	Joaçaba	SC	1	2,265
42006	Canoinhas	SC	1	2,918
42007	São Bento do Sul	SC	1	2,153
42009	Curitibanos	SC	1	2,422
42010	Campos de Lages	SC	1	2,180
43001	Santa Rosa	RS	0	1,736
43002	Três Passos	RS	0	1,849
43003	Frederico Westphalen	RS	0	2,167
43004	Erechim	RS	0	2,637
43005	Sananduva	RS	0	2,744
43006	Cerro Largo	RS	0	1,591
43007	Santo Ângelo	RS	0	1,785
43008	Ijuí	RS	0	2,108
43009	Carazinho	RS	0	2,479
43010	Passo Fundo	RS	0	2,646
43011	Cruz Alta	RS	0	2,297
43012	Não-Me-Toque	RS	0	2,574

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IBGE CODE	NAME	STATE	DUMMY	AVERAGE YIELD 2006-2008 (in kg/hectare)
43013	Soledade	RS	1	2,215
43014	Guaporé	RS	1	2,406
43015	Vacaria	RS	1	2,536
43017	Santiago	RS	0	2,306
43018	Santa Maria	RS	1	2,061
43019	Restinga Seca	RS	1	2,429
43020	Santa Cruz do Sul	RS	0	2,433
43021	Lajeado-Estrela	RS	0	2,106
43022	Cachoeira do Sul	RS	1	2,074
43025	São Jerônimo	RS	1	2,281
43028	Camaquã	RS	1	1,504
43029	Campanha Ocidental	RS	0	1,462
43030	Campanha Central	RS	1	1,706
43031	Campanha Meridional	RS	1	1,694
43032	Serras de Sudeste	RS	1	1,839
43033	Pelotas	RS	1	1,794
43034	Jaguarão	RS	1	1,915
50003	Alto Taquari	MS	0	2,565
50004	Campo Grande	MS	1	2,574
50005	Cassilândia	MS	0	2,661
50007	Três Lagoas	MS	0	2,369
50008	Nova Andradina	MS	0	2,555
50009	Bodoquena	MS	0	2,604
50010	Dourados	MS	0	2,563
50011	Iguatemi	MS	1	2,341
51001	Aripuanã	MT	1	2,920
51003	Colíder	MT	1	2,942
51004	Parecis	MT	0	2,917
51005	Arinos	MT	1	2,941
51006	Alto Teles Pires	MT	0	3,033
51007	Sinop	MT	1	2,941
51008	Paranatinga	MT	1	2,722
51009	Norte Araguaia	MT	1	2,967
51010	Canarana	MT	0	2,992
51011	Médio Araguaia	MT	1	3,063
51012	Alto Guaporé	MT	1	2,976
51013	Tangará da Serra	MT	1	2,872
51014	Jauru	MT	1	3,136
51015	Alto Paraguai	MT	0	2,970

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IBGE CODE	NAME	STATE	DUMMY	AVERAGE YIELD 2006-2008 (in kg/hectare)
51017	Cuiabá	MT	1	2,769
51018	Alto Pantanal	MT	1	2,805
51019	Primavera do Leste	MT	0	2,925
51020	Tesouro	MT	0	2,937
51021	Rondonópolis	MT	0	2,784
51022	Alto Araguaia	MT	0	2,691
52002	Rio Vermelho	GO	1	2,428
52003	Aragarças	GO	1	2,759
52004	Porangatu	GO	1	2,888
52005	Chapada dos Veadeiros	GO	1	2,900
52006	Ceres	GO	1	2,820
52007	Anápolis	GO	1	2,870
52008	Iporá	GO	1	2,901
52009	Anicuns	GO	1	2,891
52010	Goiânia	GO	1	2,764
52011	Vão do Paranã	GO	1	2,605
52012	Entorno de Brasília	GO	0	2,606
52013	Sudoeste de Goiás	GO	0	2,823
52014	Vale do Rio dos Bois	GO	0	2,616
52015	Meia Ponte	GO	0	2,521
52016	Pires do Rio	GO	1	2,830
52017	Catalão	GO	0	2,740
52018	Quirinópolis	GO	0	2,598
53001	Brasília	DF	0	2,854

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