

Socioeconomic impacts of the sugar cane agribusiness

The socioeconomic importance of the industry in Brazil is widely known and can be shown in several aspects. In **Chapter 12**, we analyze one of the most interesting aspects from a sustainability standpoint: job creation and income. However, there are two points (among several others) that we should highlight: the meaning of ethanol production for hard currency savings in the country; and the impact of the industry on the development of major equipment manufacturers, which have an international projection today.

The replacement of gasoline with ethanol has saved an important amount of foreign currency for Brazil. Computing the value of the replaced gasoline at its international market price, the imports avoided between 1976 and 2004 represented savings of US\$ 60.7 billion (at the exchange rate in December 2004). Considering interest on the foreign debt, the savings amounted to 121.3 billion. For comparison, Brazil's foreign currency reserves amounted to US\$ 49.4 billion (October 2004), or just US\$ 24.2 billion if loans from the IMF are excluded.

The industry's development required major advances from manufacturers of equipment for both the agricultural and industrial sectors. The technological level of those manufacturers has been constantly upgraded, and some of them are world leaders in their segments. Domestically, this translates to job and income creation. Equipment for sugar and ethanol production and combined heat and power generation has now a nationalization level of nearly 100 percent. They have grown since 1975 with the National Alcohol Program (PNA), and in the 1990's they recieved a great boost from sugar exports, having now developed into more efficient systems for combined heat and power and full use of sugar cane energy. There have been several remarkable examples in this process. The pace at which the industry has developed and implemented new solutions has led to the turnkey packages for the supply of distilleries and full combined heat and power systems. In ten years, the main Brazilian suppliers produced around 200 independent distilleries (and 200 corresponding combined cogeneration

plants), with a "historic" average of five plants per month. Considering production "peaks", the two leading manufacturers (Dedini and Zanini) have produced 96 milling systems in one year, and 81 distilleries per year; and an average of 63 boilers from 1973 until 1982. The leading manufacturer's (Dedini, 80% of the equipment) accumulated experience has been acquired in the course of a production of 726 distilleries (distillation units), 106 full plants, 112 combined cogeneration plants, and 1,200 boilers, with 16 full distilleries in foreign countries.

The evolution in the industry's business units, as it happens in the various other sectors of the economy, is leading companies to increasingly accept what is conventionally called "social responsibility" in the context of their business.

"Social responsibility" is a term used to describe business actions related to ethical values: compliance with the law and respect for people, communities and the environment. More specifically, it means business understood as an integral part of society, contributing to its well-being by caring about the social impacts of its policies and practices. This includes the impacts of a specific business on the levels above and below its supply chain; and the impacts of voluntary business contributions on affected communities.

Advances in this direction have intensified over the past few years, thereby consolidating principles, practices and systems for the business world and involving a growing number of companies. For example, principles are expressed in the responsibility extended to products, propositions about Factor 4 or Factor 10 in resource savings, and several voluntary codes of conduct. Practices include benchmarking, the Global Reporting Initiative (GRI), several environmental accounting methods and environmental performance indicators, life-cycle evaluations, etc. The systems include audits, ISO 14001 EMS, quality management, etc. In particular, the GRI (UNEP/several countries) creates an economic, social and environmental reporting structure in order to raise sustainability reports around the world to the level of financial reports.

In Chapter 12, we include a description of São Paulo-based companies in this context, although the subject is not limited to employment relationships.

Chapter 12: Jobs and income

Compared to Brazilian 45-percent mean index workers contributing to social security (2003), the sugar cane industry's agricultural activities now have an index of 72.9% (from 53.6% of 1992). In the Center-south, formal jobs in sugar cane production (agriculture) reach 85.8%, with 93.8% in São Paulo (2005). Differences in regional development are reflected in the industry's occupational indicators; poorer regions are characterized by lower salaries and a much larger use of labor.

12.1 Introduction

The unemployment rate in Brazil has remained at 9 to 10 percent over the past few years, a level which is a little higher than that of developed countries (except for Japan).¹ The most serious issue is job quality; for example, 55 percent of the workforce do not contribute to social security, the child (10 to 14-year-olds) labor rate was 2.4 percent (compared to 5.3% in 1992). The functional illiteracy (fewer than 3 years of study) rate of employed people dropped from 37.4 to 23.9 percent during the same ten-year period.¹ The evolution is important, but the figures are still far from ideal.

The income distribution (among employed people, 2002) indicates that 53 percent were paid up to two times the minimum wage (half of whom receiving less than minimum wage), and only 1.3 percent had a salary equivalent to more than 20 times the minimum wage.

The greatest challenge facing Brazilian society is to reduce social inequality. Over the past twenty years, even though the income has generally increased, there doesn't seem to have been a substantial improvement in inequality indicators.² Some examples of this are the national illiteracy rate (12.8% in 2000), which goes up to 28 percent in rural areas, with a corresponding mean income variation, or 26 percent in the Northeast region, taken as a whole.

It is difficult to find appropriate salary comparison indicators, even on a regional basis, and it is even harder to try to compare income on a country-to-country basis. In the following texts we seek to compare differences, but mainly as to analogous activities within the same region. Nevertheless, a set

1 NERI, M.; "Trabalho", in: Brasil em números, IBGE, vol.12, 2004

2 CARVALHO, J.M.: "Uma breve história do Brasil", *in: Brasil em números*, IBGE, vol.12, 2004

of data in respect of Brazil's and some of the selected countries' economies is shown below, as adjusted for Purchasing Power Parity (PPP).

According to international references,³ in 2002 Brazil had a Gross Domestic Product of US\$ 1.34 trillion (PPP: Purchasing Power Parity) and per capita income of US\$ 7,600 (also in PPP). In legal tender, the GDP amounted to US\$ 450 billion, and the per capita income US\$ 2,630. The mean exchange rate for that year was R\$ 2.912/US\$ 1. For reference, still using values in PPP, the Gross Domestic Product of the United States was US\$ 10.4 trillion, with per capita income of US\$ 37,600.

In 2000, the per capita GDP (PPP) was US\$ (PPP) 7,744 in Brazil, US\$ 23,917 in Germany, US\$ 22,876 in Italy, US\$ 9,661 in Poland, US\$ 11,062 in Hungary, US\$ 7,414 in Turkey, US\$ 5,795 in Colombia, and US\$ 6,715 in Thailand.

Measurements by the Gini coefficient (the coefficient ranges from zero to one; the larger the income distribution inequality, the higher the coefficient) are more inaccurate and scattered; the same source points to 0.607 in Brazil (1998), 0.567 in Chile (1998), and 0.456 in the United States (1994).

Utilization of the several countries' official minimum wages as a reference for the salaries paid is impaired by the fact that such official minimum wages do not correspond to the same functional definition, and do not follow the definitions set for each country either, in many cases. Some of the distortions in the case of Brazil are analyzed in paper prepared by IPEA,⁴ which concludes that there was (1996) a great difference to the international standards.

Sugar and ethanol agribusiness complex and independent sugar cane growers

In Brazil, unlike most countries, sugar cane is used to produce sugar, ethanol and several other products. This makes the valuation of the raw material a unique process in the world, given the need to create a measurement unit capable of translating the obtention of several products from the same source. That unit, the ATR (Total Recoverable Sugars, in Portuguese), is used in Brazil to regulate the sugar cane market.

The sugar cane may be owned by industrial units or independent growers, or produced by the industry in leased land. On average, the value of sugar cane (as an input) corresponds to 58.5 percent of the income from agribusiness endproduct sales. São Paulo State has the largest concentration of independent grow-

4 BARROS, R.P.; FOGUEL, M.; GARCIA, G.; MENDONÇA, R.: "O nível do salário mínimo no Brasil frente à evidência internacional", IPEA, 1996

3 The World Factbook

www.bartleby.com/151/

site

2003,

ers, with the actual market for raw material reaching 25 percent of the total; sugar cane is grown on approximately 11,000 agricultural properties.

Since the 1998/99 crop, the business relationship between the sugar and ethanol agribusiness complex and independent sugar cane growers has been governed by a joint self-management model. The new system has replaced one that consisted of pricing by the Federal Government, and is based on the quality of raw materials and the market price obtained for the end-products (sugar and ethanol).

The computation basis is the quantity of ATRs (Total Recoverable Sugars) contained in each ton of raw material, which are used in sugar and ethanol production. The ATR value is determined by analyzing the sucrose (sugar) content, the fiber content, purity of the sugar cane and the losses in the sugar and ethanol production processes. The price obtained for the end-products in the market is monitored by an independent organization.

The end price paid to producers is determined by a parametric model that forms the basis for individual negotiations between mills and sugar cane growers from the various regions. This model is not static and is constantly reviewed by the parties of a specific organization created by producers. In São Paulo State, that organization is called the Council of Sugar Cane, Sugar and Ethanol Producers, or CONSECANA-SP, which has a joint self-management coordination consisting of members of the industries and growers.

12.2 Labor legislation in Brazil and its application to the sugar and ethanol industry

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12.2.1 Brazilian labor legislation and union organization

Brazil's labor legislation consists of countless rules set forth in the Federal Constitution, Complementary Laws, Laws, Executive Laws, OIT Conventions (ratified by Brazil), Provisional Measures, Decrees, Ordinances, Instructions, Administrative and Regulatory Rules.

The union organization is governed by the same rules and based on two constitutional principles: a) free labor or trade association, which precludes the Public Power from interfering with or intervening in the union organization; b) unity, which prohibits the creation of more than one union, on any level, to represent one professional or economy category in the same territorial base. Employers and workers are represented by only one trade or labor union, federation and/or confederation.

12.2.2 Governing legislation

The Federal Constitution, articles 1 and 2, provides for the fundamental principles of the Federative Republic of Brazil, which are based on the Democratic Rule of Law, sovereignty, citizenship, human dignity, the social values of work and free enterprise, and political pluralism.

Articles 3 and 4 provide for the fundamental objectives and principles that govern the Federative Republic. Article 5 sets forth the fundamental rights and assurances of Brazilian citizens.

They are followed by Section II, which provides for Social Rights, as listed below:

Art.	6	Social rights
Art.	7	Rights of urban and rural workers, comprising 34 items
Art.	8	Freedom of labor or trade unions
Art.	9	Right to strike
Art.	10	Workers and employers' right to take part in the
		government agencies where their business or social
		security rights are subject to discussion
A rat	11	Employee representation for communica having more

Art. 11 Employee representation for companies having more than 200 employees

Finally, there is article 10 in the Transitory Constitutional Provisions section, which addresses termination made arbitrarily or without cause, tenure of the employee elected for a board office at CIPA (Internal Commission for Accident Prevention), tenure of pregnant employees, period of maternity/paternity leave, and payment of contributions to support rural union activities.

Right under the Constitution, there is also the Labor Code (CLT) which provides the basis of Brazil's labor legislation and governs the following aspects, among other matters:

- General and Special Labor Protection Rules
- Special Provisions on Employment Term and Conditions
- Labor Nationalization
- Woman, Child and Adolescent Labor Protection
- Individual Employment Agreement
- Union Organization
- Collective Bargaining Conventions

Even though rural and urban labor are equalized by the Constitution (article 7, Federal Constitution), rural labor is still governed by Law no. 5,889/73 and Decree no. 73,626/74. It is worth remembering that article 4, sole paragraph, of the Decree lists the articles of the CLT that are applicable to rural labor.

The Norma Regulamentadora 31 (Health and Safety for the work in Agriculture, Pasture, Forest products and Aquaculture) is considered one of the most advanced worldwide with respect to safety and comfort for the rural worker

Also applicable to the industry are other rules arising out of the capitallabor relationships, such as, for example: Law no. 605/49 (Weekly Holiday Pay); and Law 8,036/90 (Worker Dismissal Fund).

12.2.3 Union organization

Employer and employee representation in sugar and ethanol industry set forth in the table referred to in article 577 of the CLT:

1st Group – Food Industries (sugar production)

10th Group – Chemical and Pharmaceutical Industries (ethanol production)

In rural areas, sugar cane suppliers and agribusiness companies (related to the industries) are represented by rural trade unions and the State Federation of Agriculture. The workers are represented by Workers/Rural Employees Unions and/or by the local State Workers/Rural Employees Federations.

Despite the unity principle, the Brazilian legislation accepts representation by "differentiated categories." In theory, such categories exist on account of the peculiarities involving certain groups of employees, such as drivers, for example.

12.2.4 Collective rules

The law allows the parties to set up collective rules. Today, such rules could be summed up in a Collective Work Convention (Employers Union vs. Labor Union), and a Collective Work Agreement (Companies x Labor Union).

Such rules must be filed with the Labor Stations, Labor Sub-Departments or Regional Labor Departments, and may be effective for up to 2 years.

On the category's reference date, salary clauses are determined by the free negotiation criterion, as well as social clauses. Refusal to negotiate or impossibility to enter into a Collective Work Convention/Agreement may lead the parties to commence a collective labor dispute (by the latest labor rules, provided that the parties commence the dispute by mutual agreement).

Collective rules are "complementary" in their nature, and the clauses subject to negotiation cannot prevail over the legislation. If there are two rules (convention or agreement for the same employee or employer categories) effective for the same period, the rule setting the most beneficial conditions to the worker must prevail.

In this respect, it is worth pointing out that there is a lot of doctrinal and jurisprudential divergence as to the criterion to be adopted for analyzing the rule most beneficial to the worker. One stream of law interpretation thinks that the only the conflicting clause (or aspect) should be evaluated. The other thinks that such analysis should not be limited to a given conflicting clause (or aspect). Therefore, the rule to be regarded as the most beneficial is that which altogether provides for the most favorable conditions to the worker (principle known as "conglobamento").

12.2.5 Collective bargaining in São Paulo's sugar and ethanol industry

1. Sugar mills with distillery additions are represented in São Paulo State by the São Paulo State Sugar Industry's Union. Their employees are represented by 30 Food Industry Labor Unions for São Paulo State and by the Food Industry Workers' Federation for São Paulo State.

On the reference date for the category (May 1st), a Collective Work Convention is signed by the aforementioned parties. As a rule, such Convention is effective from May 1st to April 30 of the subsequent year, and provides for the rules for mill employees, such as the salary floor for the category, salary adjustments, and other social clauses.

Recently, parallel with the Collective Convention, a large number of companies have been entering into Collective Bargaining Agreements directly with the labor union for their region. Such agreements aim at providing for the rules applicable to the peculiarities of these companies for that same period (from May 1st until April 30 of the subsequent year).

Because of this new reality, the Collective Convention entered into at the state level began to expressly confirm the Collective Bargaining Agreements signed directly by the companies and the regional labor unions.

2. Ethanol distilleries are represented by the Ethanol Manufacturers' Trade Union for São Paulo State. Their employees are represented by 11 Chemical and Pharmaceutical Industry's Labor Unions for São Paulo State and by the Chemical and Pharmaceutical Industry's Federation for the State of São Paulo.

On the reference date for the category (May 1st), the Ethanol Manufacturers' Trade Union for São Paulo State and the Federation of the Chemical and Pharmaceutical Industry's Workers for São Paulo State sign a document ensuring that the reference date is May 1st and providing that the collective bargaining agreements shall be concluded on a company-to-company/region-to-region basis.

The structure of those agreements is basically identical to that of agreements between mills and food industry labor unions.

3. On the reference date, i.e. May 1st, the Sugar Industry's Trade Union for São Paulo State and the Ethanol Manufacturer's Trade Union for São Paulo State, as consenting parties (representing industry-related Agricultural Companies), sign the Collective Bargaining Convention entered into at the state level between, on the one hand, the Federation of Agriculture for São Paulo State and the rural trade unions, as representatives of the related agricultural companies and/or suppliers, and, on the other hand, the rural workers' labor unions.

Such rules replicate the basic structure of the collective rules applicable to mills and distilleries.

There are also conventions entered into by the rural trade union directly with the labor union for the region, as well as agreements entered into by the agricultural companies related to the mills and/or distilleries directly with the labor union.

Said conventions and agreements are specific to the sugar cane industry due to the creation, in 1984, of the "*Grupo Cana*", or Cane Group, with reference date on May 1st, which provided for specific rules, to wit: floor salary; compensation of the "*bituqueiros*" (workers in charge of catching the sugar cane that falls from trucks); salary adjustments; value of one ton of sugar cane for 18 months; and other specific points and social clauses.

In the rural area in the rural area, UNICA – União da Agro-indústria Canavieira do Estado de São Paulo and FERAESP – Federação dos Empregados Rurais Assalariados do Estado de São Paulo established a protocol (February 2006) aiming at improving the work relations in the sector, analysing and proposing the best practices

Finally, said collective rules usually contemplate the provision of benefits that vary from company to company, including: medical, dental, hearing and pharmaceutical care; life insurance; meals; food basket (food that meets minimum nutritional requirements set by the government); food and transportation stamps; private pension plans; disease and funeral allowances; education allowances; breakfast; Christmas baskets (packages containing the season's typical foods); agreements with supermarkets; loans; subsidized sales; and access to credit cooperatives.

12.3 Jobs and income in the agribusiness in the 1980's and 90's

12.3.1 Production system in the sugar cane industry

The sugar cane industry's production system in Brazil consisted of a large number of industrial units (> 350) with production areas ranging from 5,000 to 50,000 hectares. Such scale is much smaller if we take into consideration that the sugar cane is supplied by a group of dozens of thousands of growers, not to mention the mill owners' own growing areas; in 1986, the supply by outside growers represented 38 percent of the mills' total sugar cane.⁵ That share was reduced a little less than 30 percent over fifty years, and is growing again in some regions.

Another relevant characteristic in terms of job creation and the quality of such jobs in the industry is the seasonal pattern of the agricultural operation; the weather and agronomical conditions for sugar cane limit the harvesting period (the most labor-intensive operation) to six or seven months a year in Brazil. The level of technology used in agriculture determines the relative demand for labor in the two periods, i.e. harvesting and in-between-harvest cycles. Great differences (high "seasonal index," defined as the "labor in the harvesting period/labor in between harvest cycles" ratio) imply more temporary labor and, as a result, low salaries. This is a universal problem in agriculture.

Since two thirds of the end cost of sugar cane products (ethanol and sugar) correspond to the sugar cane cost, which is strongly dependent on the labor cost, most of the jobs in the industry are similar those in other agricultural segments in Brazil. Employment levels, job creation cost, salaries, employment relationships and job quality are always compared with those of "other crops" for the large portion of sugar cane production employees and, in sugar cane processing, with those of similar industrial segments (chemistry, fuel processing, foods).

In the early 1990's,^{6, 7} a mean rate of 21 to 24 percent of total sugar cane cost (including land, capital costs, and all other fixed and variable costs) corresponded to direct labor costs and social taxes. Including processing costs for ethanol (and also capital, marketing and other costs), the direct labor costs would reach 20 to 25 percent of the ethanol costs; labor in agriculture corresponded to more than 60 percent of the total labor cost.

In both cases (industry and agriculture), the number and quality of jobs were strongly dependent on the level of technology used, and there were substantial regional differences in Brazil. Therefore, from the employment standpoint, the sugar cane agribusiness can be said to have essentially

5 BORGES, J.M.M.: "The Brazilian alcohol program: Foundations, results, perspectives, energy", 1990, Sources 12, pp.451-461

6 GOLDEMBERG, J.; MONA-CO, L.; MACEDO, I.: "The Brazilian fuel-alcohol program", in: Renewable energy sources for fuels and electricity, Island Press, 1993

7 Fundação Getúlio Vargas: "Sistema Custo/Preço – Álcool hidratado", São Paulo, 1994 consisted since that time of a large group of agribusiness units that are similar to food production units, but very different than the energy (fuel) production sectors: it has much larger number of employees per energy unit produced, much lower job creation costs, a much wider job diversification, and a much more decentralized production.

12.3.2 Context: labor market in Brazil, 1980's and 90's

The official unemployment levels were low in Brazil⁸; the mean rate for the 1980's was 5 percent (minimum of 3% in 1989, and maximum of 8% in 1981). However, it was easy to realize that disguised unemployment was high: in 1988, 44 percent of the workers in agriculture, 6 percent in the industry, and 15 percent in services were paid less than one official minimum wage (reference), i.e. US\$ 53 / month at that time. Only 20 percent of the workers in agriculture had salaries in excess of US\$ 265/month. There were important regional differences: among the leading sugar cane growing regions (São Paulo, 66%; Northeast, 20%), salaries were much higher in São Paulo. All of these values (including the official minimum wage) are different today.

Brazil's family income distribution in 1988 indicated that 36.1% of the families were paid less than US\$ 106 / month, 67.3% had an income of less than US\$ 265 / month, and 94.3% received less than US\$ 1,060 / month.

12.3.3 Jobs and income in the sugar cane industry

We can sum up the data for two periods: the late 1980's, and the second half of the 1990's. They will then be compared by a detailed analysis of the current situation in items 12.4 and 12.5.

In the early 1990's in São Paulo⁹ (with the highest technology level and around 60% of the country's production), around 30% of all workers were specialized (agricultural supervision and industrial operations), 10% had a medium level of specialization (tractor operators and drivers, for example), and the remaining 60% had no specialization (sugar cane planting and harvesting; other industrial jobs). For every 1 M t of sugar cane, there were 2,200 direct jobs (1,600 in sugar cane production, and 600 in processing), while indirect jobs (a limited view: equipment manufacturing and maintenance, chemicals and other consumables only) were estimated at 30% of the number of direct ones. Therefore, the sugar cane industry employed a total of 380,000 people in São Paulo.

Estimations for Brazil would consider a much more intensive use of labor per production unit in the Northeast; in some cases, three times as much. The totals were estimated¹⁰ at 800,000 direct jobs and 250,000 indirect jobs in 1990.

8 BORGES, J.M.: "Geração de empregos na agroindústria canavieira", in: Desenvolvimento em harmonia com o meio ambiente, Rio de Janeiro, EB.C.N., 1992

9 BORGES, J.M.: "The effect on labor and social issues of electricity sales in the Brazilian sugar cane industry", Proceedings of the International Conference on Energy from Sugar Cane, Hawaii, Winrock International, 1991

10 MAGALHÄES, J.; MACHADO, R.; KUPER-MANN, N.: Políticas econômicas, emprego e distribuição de renda na América Latina, Rio de Janeiro, Editora Vozes, 1991

These are impressive figures *per se*, but it also important to point out the system's capacity to create jobs in a large number of places, thereby decentralizing income generation. In 1991, there were ethanol distilleries in 357 Brazilian municipalities (8% of all municipalities); the potential impact of the jobs in this industry compared to the total jobs in those municipalities was 15.6 percent, on average, reaching 28 percent in the Center-West region.

There were strong regional differences that reflected in the sugar cane industry (jobs/production unit, salaries and job quality), and technology was usually the balancing factor for the system. As the most important example, the competition for workers among the various sectors of the economy in São Paulo, in the case of sugar cane harvesting, resulted in higher salaries, better working conditions, and a much lower number of jobs (more efficient harvesting workers and, of course, higher degree of mechanical harvesting). In industrial operations, greater automation, productivity and conversion efficiency also led to a smaller number of jobs, a higher degree of specialization, and higher salaries.

A study conducted in the mid 1980's by the University of São Paulo¹¹ in 15 towns in the largest sugar cane growing areas pointed to local population growth in all cases, and reversal of the trend towards migration to large urban centers in most cases. The positive impacts (jobs, taxes resulting in infrastructure improvements) were substantial in the Center-South, but relatively smaller in other regions.

In São Paulo, non-specialized workers (sugar cane cutters) would have a mean income of US\$ 140/month. In the context of the Brazilian economy at that time, such income was higher than that of 86 percent of agricultural workers, 46 percent of industrial workers, and 56 percent of the workers in the service sector. The family income of those workers (sugar cane cutters) was estimated⁹ at US\$ 220 / month, annual average; which was higher than the income of 50 percent of all Brazilian families. On the other hand, the seasonal index would result in US\$ 280 / month in the harvesting period, and only US\$ 160 / month in between harvesting cycles.

The seasonal index for sugar cane crops was estimated at 2.2 in the late 1970's¹²; coffee, with an index of 2.0, was the only major culture to be in a better situation in São Paulo. Several factors contributed to reducing that coefficient in the 1980's and 90's, including utilization of the same personnel for soil conservation and maintenance tasks in between harvesting cycles, and a strong decrease in harvesting labor requirements due to the expansion of mechanical harvesting. Estimations in the late 1980's⁹ pointed to a seasonal index of 1.8, while in the 1990's several mills had an mean index of 1.3.¹³ This is a clear trend, and it is now considered that most agricultural

11 JOHNSON, B.; WRIGHT, T.: "Impactos comunitários do Proálcool", Report to STI-MIC, FEA-USP, 1983

9 see p. 209

12 AIAA – Assoc. Indústrias de Açúcar e Álcool, SP: "Açúcar e álcool: Energia para um crescimento econômico autosustentado", São Paulo, DATAGRO, 1991

13 MARQUES, J.C.: Private communication, economic consultant to Copersucar, São Paulo, 1995 jobs may be permanent, allowing training and career planning. In this aspect, also, the figures were different for the Northeast region; in São Paulo, mechanical harvesting advanced rapidly due to legal restrictions on the burning of sugar cane and the increasing cost of labor as of the mid 1990's.

The estimations of the investment required for job creation in the sugar cane industry reflect some of the aforementioned regional differences (technology, productivity levels). In the 1980's, values as low as US\$ 11,000/job were attained,¹² which are probably appropriate for the Northeast region. In the Center-South, analyzes⁸ pointed to amounts ranging from US\$ 23,000/job, excluding the investment in land, to US\$ 45,000/job, for annual jobs and including investment in land. For comparison, the mean investment in job creation in the 35 leading sectors of Brazil's economy in 1991 ranged from US\$ 10,000 to US\$ 125,000, with an average of US\$ 41,000. Selected agribusiness activities (foods, beverage, pulp and paper) required US\$ 50,000/job; US\$ 44,000/job in the service sector (trade, supermarkets, communications, hotels), and US\$ 125,000/job in the chemical industry. Only 14 sectors could create jobs using less capital than the sugar cane industry. In less developed regions, the investment per job was much lower than the Brazilian average.

In the late 1990's the situation was well-evaluated by a survey¹⁴ based on the Brazilian economy's input-product base (IBGE, 1997). That allowed not only the creation of direct and indirect jobs, but also the creation of induced jobs to be evaluated. The results were as follows: 654,000 direct jobs, 937,000 indirect jobs, and 1,800,000 induced jobs. It is noticeable that even though the production of sugar cane (and other end products) increased in that decade, the number of direct jobs decreased (as expected due to the higher concentration in the Center-South region and the expansion of mechanical harvesting and automation), while many other jobs were outsourced, thereby significantly increasing the proportion of indirect jobs. Regional differences keep influencing the industry: although the Northeast region accounts for only 18.6 percent of the production, it uses 44.3 percent of the workforce (i.e. 3.5 times as many workers per product unit). The resulting difference in job quality is evident in the distribution of education levels among the industry's workers (direct jobs): **12** see p. 210 **8** see p. 209

14 GUILHOTO, J.J.M.: "Geração de emprego nos setores produtores de cana-de-açúcar, açúcar e álcool no Brasil e suas macro-regiões", Report "Cenários para o setor de Açúcar e Álcool", MB Associados and FIPE, Abril, 2001

 Table 1: Worker distribution by education level: direct jobs,

 Brazil and regions: sugar cane and products

Years at school	Brazil (%)	Southeast (%)	Northeast (%)
< 1	31.5	17.1	48.8
1 - 3	27.3	29.1	27.6
4 - 7	28.0	36.4	14.7
> 8	13.2	17.4	8.9

12.4 Number and quality of jobs in the sugar cane agribusiness

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For analyzing the number and quality of jobs in the sugar cane, sugar and ethanol industries in Brazil, two databases were used: for the formal labor market, RAIS (Administrative Records of the Labor and Employment Ministry); and, as a complement to the latter, PNADs (National Household Sample Research, conducted by IBGE), which include informal jobs.

12.4.1 The formal labor market

RAIS, which covers 90 percent of the organized sector of the economy, has information formally provided by companies to the Labor and Employment Ministry. The main limitations are errors and omissions in completing the questionnaires, which occur more commonly in small towns and some specific sectors (agriculture, construction, public management). In addition, because of the structure of such questionnaires, outsourced workers are not included in the user sector, and neither are indirect jobs. In the income evaluation, the 13th salary (a mandatory annual bonus equivalent to one month's salary) is not included.

Table 2 shows the evolution in the combined number of employees of the three industries in Brazil and its sugar cane producing regions: the Northeast and the Center-South. It shows a rise of 52.9 percent in the number of direct jobs for the sugar cane, sugar and ethanol industries. In 2005, 63 percent of all formal jobs were in the Center-South region.

Producing region	Formal direct jobs						
r roducing region	2000	2002	2004	2005			
N-NE	250,224	289,507	343,026	364,443			
C-S	392,624	475,086	557,742	618,161			
Total, Brazil	642,848	764,593	900,768	982,604			

Table 2: Formal employees by producing region and total for Brazil 2000-2005

Source: Prepared from RAIS data, Labor and Employment Ministry, several years

Table 3 shows the evolution in number of employees by region and by industry. It shows that the lower growth rate occurred in agriculture (16.2%). The relative share of agriculture fell from 55.5 percent to 42.2 percent of the total, while in the industrial sector it increased, reflecting the expansion of both production and agricultural mechanization.

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Industry	Perion	Formal direct jobs					
mdustry	Region	2000	2002	2004	2005		
	N-NE	81,191	86,329	104,820	100,494		
Sugar cane	C-S	275,795	281,291	283,820	314,174		
	Total	356,986	367,620	388,121	414,668		
	N-NE	143,303	174,934	211,864	232,120		
Sugar	C-S	74,421	126,939	193,626	207,453		
	Total	217,724	301,873	405,490	439,573		
	N-NE	25,730	28,244	26,342	31,829		
Ethanol	C-S	42,408	66,856	80,815	96,534		
	Total	68,138	95,100	107,157	128,363		
Total		642,848	764,593	900,768	982,604		

Table 3: Formal, direct jobs by producing region and by industry,2000-2005

Source: Prepared from RAIS data, Labor and Employment Ministry, several years

Table 4 (p. 214) shows the number of people formally employed grouped by producing region (N-NE and CS), considering age groups and education levels, for the year 2002.¹⁵ By analyzing Brazil as a whole, we note that the 30-39 age group is the largest (28.5% of the total). By adding age groups between 18 and 49, we come up to 90.8 percent of all employees. It is important to emphasize the small share (0.2%) of employees less than 17 years of age. The data for producing regions show a similar trend to that in Brazil: small proportion of employees under 17 years of age, and a vast majority of employees (around 90%) aged 18 to 49.

Concerning the mean education level in the three sectors, **Table 4** shows that the group of workers in cane production averages of 4.2 school years; the average is 4.3 for the sugar industry, and 5.8 for the ethanol industry. Considering the three sectors together, the workers having not concluded 4th grade prevailed in Brazil in 2005 (35.2%), followed by those who finished 4th grade (18.8%). An important fraction of illiterate workers is shown (11.3%).

When the main producing regions are analyzed separately, the workers' profile changes significantly. For sugar cane crops in the North-Northeast region, 29.3 percent of all workers are illiterate, and 47.8 percent did not finish 4th grade, making up 77.1 percent of the workers. A low education level is shown for sugar production as well, where 24.9 percent of the workers are illiterate and

15 Specific data for each region (North, Northeast, South, Southeast and Center-West), as well as for the main producing states, are found in MORAES, M.A.E.D.; PESSINI, M.: "Analysis of the labor market of the Brazilian Sugar and Alcohol Sector", World Bank, 2004

	Brazil	North-Northeast		Center-South			
Age groups		Cana	Açúcar	Álcool	Cana	Açúcar	Álcool
Up to 17 y. old*	1,514	221	229	14	668	302	80
18-24	246,299	23,755	60,187	8,846	79,929	50,790	22,792
25-29	191,272	18,687	47,093	6,606	61,209	39,272	18,405
30-39	280,267	28,264	65,400	9,029	89,343	59,641	28,590
40-49	174,458	18,409	39,229	5,215	54,624	39,126	17,855
50-64	83,695	10,732	19,227	2,058	26,321	17,030	8,327
65 years or older	5,097	424	755	61	2,080	1,292	485
Unknown	2	2	0	0	0	0	0
Total	982,604	100,494	232,120	31,829	314,174	207,453	96,534
Education		-	-		-		
Illiterate	111,516	29,467	57,764	2,348	13,569	4,832	3,536
4 th grade not concluded	345,652	47,993	109,945	12,908	95,248	55,773	23,785
4 th grade concluded	184,290	9,530	21,040	9,578	79,152	45,172	19,818
8 th grade not concluded	142,100	7,169	19,478	2,632	62,181	34,075	16,565
8 th grade concluded	70,749	1,947	7,190	1,638	30,876	18,733	10,365
High school drop-out	38,911	1,697	5,548	728	12,676	12,411	5,851
High school graduate	71,537	2,216	8,920	1,437	16,504	28,743	13,717
College drop-out	5,518	143	572	123	1,465	2,195	1,020
College graduate	12,331	332	1,663	437	2,503	5,519	1,877
Total	982,604	100,494	232,120	31,829	314,174	207,453	96,534

Table 4: People employed in sugar cane, sugar and ethanol production by geographic region, considering age groups and education levels, 2005

Source: Prepared from RAIS data, Labor and Employment Ministry, 2005 * For 2005 the first age group data available is "up to 17"

	Brazil	No	rth-Northe	east	С	enter-Sout	h	
Age groups		Cane	Sugar	Ethanol	Cane	Sugar	Ethanol	
Up to 17 y.old	348.76	294.51	321.86	360.80	398.94	281.59	408.14	
18-24	551.64	393.09	407.87	416.39	633.02	667.36	605.82	
25-29	638.77	438.84	467.69	470.96	711.16	818.60	715.27	
30-39	705.58	472.21	523.99	521.06	737.66	948.73	802.44	
40-49	795.35	486.43	598.59	649.58	775.49	1121.63	934.53	
50-64	758.60	456.24	621.01	738.44	728.27	1103.79	860.89	
65 years old or older	826.34	528.66	955.67	983.65	735.71	996.47	800.92	
Unknown	388.60	388.60	0.00	0.00	0.00	0.00	0.00	
Total	674.52	448.05	504.31	517.50	710.93	899.87	768.54	
Education								
Illiterate	417.92	382.07	382.05	394.26	571.72	578.45	508.79	
4 th grade not concluded	527.09	422.83	437.58	441.26	603.31	655.49	591.46	
4 th grade concluded	720.20	467.62	528.99	504.95	748.51	881.91	667.04	
8 th grade not concluded	684.30	553.49	581.01	553.85	666.70	806.40	698.02	
8 th grade concluded	780.71	552.39	682.94	550.04	746.38	905.82	804.01	
High school drop-out	756.70	580.15	628.63	562.03	750.49	837.04	796.61	
High school graduate	981.27	882.21	921.64	741.37	948.98	1049.59	956.85	
College drop- out	1414.38	964.47	1696.33	1303.64	1159.88	1613.07	1270.66	
College graduate	3353.09	2703.02	4116.29	2334.32	3001.69	3432.75	3263.44	
Total	674.52	448.05	504.31	517.50	710.93	899.87	768.54	

Table 5: Mean monthly salary by age group and education level; sugar cane, sugar and ethanol; Brazil and producing regions, R\$, 2005¹

Source: Prepared from RAIS data, Labor and Employment Ministry, 2005

1 Current values in R\$ for 2005

47.4 percent did not graduate from 4th grade (72.3% of all workers). The situation is better in ethanol production, but the low education level still prevails: 7.4 percent are illiterate and 40.6 percent did not conclude 4th grade.

In turn, the Center-South region has the best education indicators: in the sugar cane culture, 4.3 percent of the workers are illiterate and 30.3 percent did not conclude 4th grade (totaling 34.7 percent of all workers); in sugar production, 2.3 percent are illiterate and 26.9 percent did not finish 4th grade; and in ethanol production, 3.7 percent are illiterate and 26.9 percent failed to graduate from 4th grade.

The compensation of formal employees of the sugar cane, sugar and ethanol industries (2005) is shown in Table 5 (p. 213).

The mean monthly salary (2005) for all three sectors in Brazil was R\$ 674.52.

Considering the regions separately, the mean monthly salary for the sugar industry in the N-NE region was R\$ 504.31, whereas for the Center-South region it was R\$ 899.07 (78.4% higher); in the ethanol industry, the mean salary was R\$ 517.50 in the former region, and R\$ 768.54 in the Center-South region (48.5% higher); the lowest mean salary was found in the sugar cane culture, for which it amounted to R\$ 448.05 in the North-Northeast and R\$ 710.93 in the Center-South region (58.7% higher). As expected, there is a positive correlation between education level and income.

12.4.2 Inclusion of the informal labor market: PNAD

To consider both formal and informal jobs, we used the data from the National Household Sample Survey (PNAD) conducted by the Brazilian Institute of Geography and Statistics (IBGE). The PNAD and RAIS data are not directly comparable, as they result from different collection methodologies; the RAIS is a census of the formal labor market, and the relevant questionnaire is completed by the employer, whereas PNAD interviews are at the employee's home. In this case, the analysis unit is the business establishment, and the answers to the interview refer to the business establishment's main activity. Considering the peculiarities of each database, the collected variables usually show the same trends, and PNAD is very useful to evaluating the level of informal jobs, which is not detected by RAIS.

Table 6 shows the evolution of the number of employees in the sugar cane industry from 1992 to 2005. During such period, it shows that there was a decrease in number of employees of approximately 23 percent, which is partly due to the expansion of mechanical harvesting in sugar cane crops. It also shows that proportion of permanent and temporary employees was reasonably stable,

and the share of permanent employees was bigger in some years.

Table 7 shows the evolution of formal employment in agriculture (sugar cane crops) for Brazil, the main sugar cane growing regions, and São Paulo State. The total number of employees with formal working papers in Brazil increased from 53.6 percent in 1992 to 72.9 percent in 2005. The level of formal employment in the Center-South region (particularly in São Paulo

III St					
Vearc	Permar	nent	Tempo	Total	
Icars	Employees	%	Employees	%	10141
1992	368,684	54.7	305,946	45.3	674,630
1993	373,903	60.6	242,766	39.4	616,669
1995	380,099	61.4	238,797	48.6	618,896
1996	378,273	59.1	260,873	40.8	639,146
1997	323,699	57.8	236,012	42.1	559,711
1998	322,601	70.7	133,368	29.2	455,969
1999	300,098	65.0	161,410	35.0	461,508
2001	222,418	53.6	192,671	46.4	415,089
2002	246,357	54.6	205,000	45.4	415,357
2003	229,981	51.2	218,902	48.8	448,883
2004	252.394	51.1	241,682	48.9	494,076
2005	293.631	56.6	225,566	43.4	519,197

Table 6: Evolution of the number of permanent and temporary employees in sugar cane production

Source: PNAD, multiple years; no PNAD data for the years 1994 and 2000

State) is much higher than in the other regions, in the aggregate, with 93.8 percent of all workers in the state having their formal working papers in 2005.

							_	
	1992		2003		2004		2005	
	Total	Formal	Total	Formal	Total	Formal	Total	Formal
Brazil	674.630	53,6%	448.883	68,8%	494.076	69,6%	519.197	72,9%
NNE	352.905	42,3%	261.283	58,9%	245.050	59%	268.759	60,8%
CS	321.725	66,0%	187.600	82,8%	249.026	79,9%	250.438	85,8%
SP	149.360	80,4%	124.534	88,4%	179.156	86,6%	153.719	93,8%

Table 7: Employees with regular working papers (formal), agriculture

Source: PNAD, 1992, 2003, 2004 and 2005

12.5 Income of people engaged in Brazil's sugar cane agribusiness

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12.5.1 Introduction

The analysis of income distribution for people engaged in the main activity of sugar cane cropping, sugar production and/or ethanol production¹⁶ is summarized in this paper. The group formed by everyone in these activities is considered, but with an emphasis on those who are actually employed (wage earners). The analysis is based on data from the National Household Sample Survey (PNAD) of 2005, as provided by IBGE. All statistical analyses take into account the expansion factor associated with each sample observation, as provided by IBGE. The income of people employed in the sugar cane business is compared to the income of those employed in other crops (rice, soybean, coffee, etc.). The analysis considers Brazil as a whole, and the contrast between the North-Northeast and the Center-South, which an emphasis on São Paulo State. The PNAD data allow no consideration of "migrating" workers separately.

It is important to point out that the income information is understated in the PNADs. A comparison of previous PNADs with the income information obtained by the National Accounts shows that the income stated in the former correspond to around 60 percent of the correct value. The degree of understatement is likely to be higher for higher incomes, causing the PNAD (or Demographic Census) data to underestimate the existing degree of inequality.

12.5.2 The income of people engaged in the agribusiness: sugar cane culture and sugar and ethanol industries

The mean income of employed people all over Brazil in 2005, grouped by sector (agriculture, industry, and services), is shown in **Table 8**. The PNAD analysis refers to 53 million private homes, with 180 million people; the *per capita* household income was R\$ 436 (on average), with a median income of R\$ 238 and Gini coefficient of 0.567.

Table 9 shows the main income distribution characteristics for people engaged in the sugar cane culture, the sugar industry, the ethanol industry, and three more aggregated industrial fields: foods and beverages (including sugar), fuels (coke, oil refining, nuclear fuels, and alcohol production), and the chemical industry.

Sugar cane (agricultural production) displays the lowest wages and low

16 HOFFMANN, R.: "Rendimento e pobreza urbana, rural e na cultura da cana-de-açúcar", Workshop: Mercado de trabalho, Setor Açúcar e Álcool: desafios atuais e perspectivas futuras, ESALQ-USP, 2004

Chapter 12: Jobs and income

Table 8: Income for all jobs; engaged people, Brazil, 2005									
Statistic	Brazil	Agriculture	Industry	Services					
People (1,000)	76,066	9,736	17,789	42,58					
Education (years)	7.9	3.4	7.4	8.8					
Income (R\$/month)	801	462	770	821					
Gini coefficient	0.543	0.555	0.493	0.537					

mean education level, the latter being less than ¹/₃ of the mean education in the fuel industry and chemical industry, and less than half the value corresponding to the sugar, ethanol or food industry. The mean income in sugar cane crops is higher than half the corresponding amount in the sugar and alcohol industries, but the median income of those engaged in the sugar cane culture¹⁶ is substantially less than half the corresponding value for those two industries; the inequality in the income distribution of people engaged in the sugar cane culture is greater than in sugar or ethanol production. The income in sugar cane crops should be compared with that of other crops.

Table 10 shows the regional contrasts in the education level and income between people working in sugar cane crops and those employed in the sugar and ethanol industries. Both the mean education level and the mean income are always higher in the Center-South than in the North-Northeast, but the differences between the two regions are much greater in the sugar cane

U						
Statistic	Sugar cane crops	Sugar	Ethanol	Foods and bev- erages	Fuels ²	Chem- icals
People (1.000)	565.9	122.4	79.9	1.851.3	114.1	683.4
Mean age	34.7	34.4	34.6	34.5	34.9	34.7
Mean education level (years)	35	7.1	8.3	7.3	9.5	9.4
Mean income (R\$) ³	495.5	742.0	960.5	613.5	1.394.3	1.332.6
Gini coefficient	0.413	0.347	0.365	0.451	0.446	0.568

Table 9: Mean income in all jobs for people occupied, or engaged, in the sugar cane culture and similar industries¹; Brazil, 2005

1 Only people having declared positive income values for all jobs.

2 Coke production, oil refining, nuclear fuel production and ethanol production.

3 R\$, 2003

16 see p. 218

culture than in the two industries.

The analysis can be limited to people whose occupation is described as *employee*, excluding, therefore, stand-alone professionals, employers, workers who produce for their own consumption, and other non-paid workers. **Table 11** refers to the jobs of *employees* in sugar cane, sugar and ethanol production, along with their regional distribution for comparison with **Table 10**. Education and

Activity field		Cane	Sugar	Ethanol
Progil	I (R\$)	495.5	742.0	960.5
DIazii	E (years)	3.5	7.1	8.3
NNE	I (R\$)	316.3	600.3	_1
IN-INE	E (years)	2.3	5.5	_1
CS	I (R\$)	697.3	839.1	985.4
C-3	E (years)	4.8	8.3	8.5
SD	I (R\$)	810.0	836.9	1.196.4
51	E (years)	5.1	8.4	9.3

Table 10: Mean income for all jobs and education level of peopleoccupied (sugar cane, sugar and ethanol)

I: income, R\$ / month

E: education level, years

 ${\bf 1}$ Only 6 people in the sample

Table 11: Mean income for all jobs and education level of employees (sugar cane, sugar and ethanol)

Activity field		Cane	Sugar	Ethanol
Brozil	I (R\$)	429.1	723.4	960.5
DIAZII	E (years)	3.5	7.1	8.3
NNE	I (R\$)	305.3	559.0	_1
IN-INE	E (years)	2.3	5.5	_1
CS	I (R\$)	561.9	835.7	985.4
C-3	E (years)	4.7	8.4	8.5
SD	I (R\$)	642.8	836.9	1.196.4
51	E (years)	4.9	8.4	9.3

I: income, R\$ / month

E: education level, years

1 Only 6 people in the sample

income levels in the Center-South are always higher than in the North-Northeast, and the regional contrast is more intense for sugar cane culture employees.

12.5.3 Agriculture: people occupied in sugar cane crops

In the PNAD sample for 2005 there are 1,162 working persons whose main activity is the sugar cane culture, and that sample corresponds to a population of 608,070 people. **Table 12** shows the distribution of such people according to their working position.

The table shows that stand-alone workers, workers who produce for their own consumption and non-paid workers represent 17.1 percent of the occupations in sugar cane crops in the North-Northeast, but only 7.1 percent in the Center-South (0.5 in São Paulo), which demonstrates that the activity in the Center-South is more "corporate" in its nature. The regional differences in education and income levels in agriculture are shown in **Table 13**; the mean education level in the North-Northeast represents half of that in the Center-South, and the mean income in the former is equivalent to just 45 percent of that in the latter. Concerning the mean income of employed people in the Center-South (and SP), inequality is substantially bigger than in Brazil, taken as a whole, as shown by the Gini coefficients in **Table 13**. In the Center-South, agriculture generates higher incomes than in the Northeast, but the relative difference is particularly high for employers (businessmen).

Working position		w/ working papers	w/o working papers	Stand- alone	Employ- er	Prod. for own cons.	Non- paid	Total
Brazil	N°	378.38	141.13	36.010	12.530	1.686	38.326	608.07
Drazii	%	62.2	23.2	5.9	2.1	0.3	6.3	100.0
N-NE	N°	163.41	105.66	25.370	5.805	1.093	30.054	331.40
	%	49.3	31.9	7.7	1.7	0.5	9.1	100.0
C-S	N°	214.96	35.475	10.640	6.725	593	8.272	276.66
	%	77.7	12.8	33.9	2.4	0.2	3.0	100.0
SP	N°	144.21	9.503	864	4.319	-	-	158.90
	%	90.8	6.0	0.5	2.7	-	-	100.0

Table 12: People working in sugar cane crops according to their working position in Brazil, the North-Northeast region, the Center-South region, and SP (2005 PNAD)

Brazil, North-Northeast and Center-South regions, and SP, 2005						
	No. of people (1.000)	Mean age	Mean edu- cation level (years)	Mean income (R\$)	Median income (R\$)	Gini coeffi- cient
Brazil	565.9	34.7	3.5	495.5	320	0.413
N-NE	299.8	33.8	2.3	316.3	300	0.259
C-S	266.1	35.7	4.8	697.3	500	0.433
SP	157.2	35.8	5.1	810.0	550	0.413

 Table 13: People occupied in sugar cane crops with positive income:

 Brazil, North-Northeast and Center-South regions, and SP, 2005

12.5.4 Income for work in sugar cane crops compared with other crops

 Table 14 allows us to compare people's mean income for work in sugar cane crops with the mean income in several other crops.

People's income in the North-Northeast region is always substantially lower than in the Center-South. The relative differences between the regions are generally larger in terms of the combined income of everyone engaged in the activity (including employers and stand-alone workers) than they are when the analysis is limited to employees.¹⁶

 Table 14: Mean income for all jobs and education levels of people working in several crops, 2005

Crop		Rice	Banana	Coffee	Sugar cane	Citrus	Manioc	Corn	Soy- bean
Brazil -	I1	294.8	359.0	454.1	495.5	591.3	235.1	227.9	1.222.2
	E2	2.4	3.4	3.7	3.5	4.6	2.1	2.5	5.7
N-NE	Ι	218.7	296.3	438.1	316.3	283.5	223.3	157.2	584.7
	Е	2.0	3.0	2.8	2.3	2.7	1.9	1.8	4.5
C-S	Ι	610.6	469.9	458.2	697.3	734.7	306.6	338.4	1.265.5
	Е	4.3	4.0	3.9	4.8	5.4	3.4	3.6	5.8
SP	Ι	_3	436.0	837.3	810.0	807.5	588.2	585.8	945.7
	Е	_3	3.0	5.2	5.1	5.6	4.5	4.8	7.7

1 I: income, R\$ / month

2 E: education level, years

3 Fewer than 10 observations in the sample

The lowest income levels are associated with corn and manioc crops, with a large number of small producers. For rice, it would be appropriate to consider irrigated crops in the South; in the North-Northeast region, the income level in rice crops is similar to that of manioc crops.

The income of people working in sugar cane crops is higher than in coffee crops, on average. For employees, the mean income in sugar cane crops is higher than in citrus growing.¹⁶

Soybean crops stand out from others for their high income and mean education levels of those engaged in the activity. 41.1 percent of the people employed in soybean crops are tractor operators, compared to 4.3 percent in sugar cane crops, 4.0 percent in corn crops, 14.2 percent citrus crops, and 22.7 percent in rice crops.

12.6 Social responsibility and benefits

Maria Luiza Barbosa UNICA – Union of the Sugar Cane Agro-Industry in São Paulo

The direct jobs created in Brazil's sugar cane agribusiness, from cane production to processing into ethanol and sugar, are estimated at around one million, plus a few million indirect jobs (see items 12.2, 12.4 and 12.5). Decentralized throughout rural Brazil and with a high spreading power on the regional economies, this labor-intensive activity has a history of social insertion and interactivity with neighboring communities.

The benefits arising out of the essence of the business are determined based on a product/investment ratio that is favorably comparable to other production activities: the industry invested US\$ 10,000 per job created (in some of the country's poorest areas), while manufacturers of consumer goods needed to invest US\$ 44,000 per job; in the petrochemistry sector, that investment reached US\$ 200,000. In the current expansion process, the industry has played a significant role in reducing migration flows to the cities. Its competitive position in the international market creates the conditions to expand socially responsible activities in the fields of education, housing, environment and health, thereby contributing to improve the quality of life of hundreds of Brazilian municipalities. The production units in Brazil maintain more than 600 schools, 200 nursery centers and 300 day care units. **Table 15** shows the frequency of benefits for a sample of São Paulo-based sugar and ethanol companies (2003).¹⁷

Surveys of projects for the social area are not part of the requirements of the Brazilian legislation. Therefore, the data they present refer to voluntary answers. A survey conducted in São Paulo State with 50 sugar and ethanol

17 BARBOSA, M.L.: Internal report, UNICA, São Paulo, 2005

Table 15:Benefits, sample 47 mills, São Paulo, 2003 (%)				
Healthcare	95.7			
Dental care	93.5			
Transportation	93.3			
Collective life insurance	91.5			
Meals	87.0			
Pharmaceutical care	85.1			
Hearing care	63.8			
Funeral allowance	61.7			
Christmas basket	59.1			
Food basket ¹	43.5			
Credit cooperative	37.8			
Club / association	36.4			
Education allowance	35.6			
Other	32.6			
Food stamps	29.5			
Private pension plans	23.9			
Breakfast	21.3			
Disease allowance	20.0			
Loan / financing	15.2			
Agreement with supermarkets	8.9			
Subsidized sales	2.3			
Consumption cooperative	0.0			

1 Food that meets minimum nutritional requirements set by the government

18 BARBOSA, M.L.; SALLUM, E.A.A.: Internal report, UNICA, 2004 companies¹⁸ shows that 34 million people residing in the 150 municipalities within their direct influence area have benefited from them, whether directly or indirectly. Some of the indicators concerning the relationship of the organizations that answered the questionnaire are listed below:

- 95% of the companies have daycare units/nursery centers;
- 98% of the companies have worker rooms;
- 86% provide accommodation for workers from other locations;
- 84% of the companies already have profit-sharing plans;
- 74.8% of the workers were born in São Paulo State, while the others come from other states;

• 90% of the workers are duly registered by the companies they work for, and the remaining 10% are outsourced;

• 58.3% of those companies already employ physically challenged workers at the rates required by the law (Art. 93 of Law no. 8,213/91).

The foregoing data support the acknowledgement by the 90 member companies of the Union of the Sugar Cane Agribusiness in São Paulo that their performance – starting from their increased production – needs backing according to the modern social responsibility parameters, as defined in Agenda 21, which has been consolidated during the World Conference on the Environment held in Rio de Janeiro in 1992. The industry in São Paulo State is a benchmark for all companies in Brazil, featuring the highest salary levels in the business (industry and agriculture; see **item 12.5**) and a high rate of formal employment (~ 95%), while being committed to systematizing and monitoring social responsibility actions. On the social front, 420 projects in the fields of education, health, sports, quality of life, culture and environmental information are now being carried out for the benefit of collaborators and communities.

The topics adopted by Agenda 21 cover a bread range of aspects of human life and need to be monitored by a discerning measurement system. By the highest precepts, Agenda 21 contains proposals that the nations had never bothered to quantify. Also, notwithstanding that some governments' hesitance has hindered the implementation of some of its concepts, there has been considerable progress. Decentralizing the decision-making process and appreciation of human existence are some of the required conditions to promote the evolution of environmental awareness, with special attention to spaces taken up by activities that were until then considered to be on a lower relative development level, such as agriculture. Therefore the sustainable development concept and the concern about the methods to account for problems and ongoing actions to cure them.

Sustainability is in the root of the very activity of the industry, which essentially transforms sunlight into foods and commercial energy: sugar as food, ethanol as fuel for vehicles, and also the electrical power that is produced by burning the sugar cane bagasse. Relying on that purpose for a permanent job creation and retention, as well as continued job quality improvement, from the plantation to fuel distribution, it is a stable income distribution initiative.

Monitoring the life conditions of the rural workforce in Brazil is one of the main challenges to be overcome before the country can follow the recommendations of Agenda 21. In this respect, the sugar and ethanol companies based in São Paulo State adopted in 2002 the Social Balance Sheet concept (IBASE model) through UNICA, and the reports that they prepare now serve also as a tool to detect and demonstrate, both quantitatively and qualitatively, the existing conditions and the evolution in both the internal social context and the relationship with the community.

Some of the indicators of the IBASE Social Balance Sheets¹⁹ for 73 São Paulo-based companies (2003, denoting expenses as a percentage of the payroll) are presented below:

Private pension plans	0.81%
Healthcare	5.9%
Education	0.93%
Capacity building and professional development	0.97%
Daycare units	0.27%
Profit-sharing programs	6.72%
Food	6.54%
Occupational safety & health	2.34%

19 IBASE: Balanço Social (Mills associated to UNICA), 2004

Willing to seek internationally accepted benchmarks for those practices, the sugar and ethanol industry has established, through UNICA, a partnership with the World Bank Institute to provide researchers and professionals in the business with training on the basics of sustainable competitiveness and corporate responsibility. In 2004 and 2005, 2,500 people (executives and employees in the sugar mills) participated in the program, aiming at knowing the best practices (World Bank's methodology) and qualifying to assess practical situations and reach reliable diagnostics.

A comprehensive program to help enterprises to identify impacts and to evaluate their sustainability was established using the international methodology of the Business and Economic Development research; this work is conducted in partnership with Instituto Ethos (Brasil), BSR – Business for Social Responsibility (EUA), Institute of Social an Ethical Accountability (England) and Fundação Dom Cabral (Brasil). In 2006 the first 30 enterprises were included, with 650 participants; the next step wil involve 30 more sugar mills.

12.7 Technologies being implemented and impacts on jobs and income

The Sugar Cane Technology Center, among others,^{20, 21, 22} has evaluated the impact of sugar cane harvesting without trash burning on the workforce.²³ For a future situation of 100-percent mechanical harvesting in S. Paulo, and 50 percent in the rest of the country, 165,000 jobs would be lost compared to the fully manual harvesting system. This process is in progress. On the other hand, the use of trash as an energy source may create approximately 12,000 new jobs in agriculture for the option of using balers. Indirect jobs are not included in the computation.

12.8 Summary and conclusions

• The replacement of gasoline with ethanol has saved an important amount of foreign currency for Brazil. Computing the value of the replaced gasoline at its international market price, the imports avoided between 1976 and 2004 represented savings of US\$ 60.7 billion (at the exchange rate in December 2004). Considering interest on the foreign debt, the savings amounted to 121.3 billion. For comparison, Brazil's foreign currency reserves amounted to US\$ 49.4 billion (October 2004), or just US\$ 24.2 billion if loans from the IMF are excluded.

• The Brazilian industry supplying equipment for cane, sugar and ethanol production developed into a leading position; the largest manufacturer, alone, produced 726 distilleries (distillation units), 106 full plants, 112 combined cogeneration plants, and 1,200 boilers (including exported units).

• Brazil has had an unemployment rate of 9 to 10 percent over the past few years. Job quality and income distribution are serious problems; the Gini coefficient was 0.607 (1998) and 0.554 (2003). Notwithstanding the increase in income, social inequalities have not been significantly reduced over the past 20 years. Workers who do not contribute to the social security system are estimated at 55 percent; the rates of child labor (2.4%, 10-14 year-olds) and functional illiteracy (23.9%, less than 3 years at school) have been significantly lowered, but are still high. The per capita income in 2002 was US\$ (PPP) 7,600.00.

• Brazil's labor legislation is renowned for being advanced in worker protection; the union organization is developed and plays a key role in employment relationships. For sugar cane, the specific aspects of employment relations in agriculture (specific unions) and industrial operations (unions of the food and chemical industries) are well-defined,

20 GONÇALES, J.S.; SOUZA, S.A.M.: "Proibição de queima de cana no Estado de São Paulo: simulação dos efeitos na área cultivada e na demanda da forca de trabalho", Informações Econômicas, São Paulo, vol. 28, no. 3, Mar. 1998, pp. 21-40 21 CAMARGO, J.M.: "Tecnificação da cana-deacúcar em São Paulo e sazonalidade da mão-deobra", Master's thesis -FEA-USP, 1988, 202p.

22 VEIGA FILHO, A.A. *et al.*: "Análise da mecanização do corte da cana-deaçúcar no Estado de São Paulo", Informações Econômicas, São Paulo, vol. 24, no. 10, Oct. 1994, pp. 43-58

23 "Manpower: Agricultural Systems", Technical report RLT-041, Project BRA/96/G31 – Biomass power generation with sugar cane bagasee and trash, UNDP/Copersucar, Centro de Tecnologia Canavieira

including the conclusion of collective agreements, which advanced during the last decade. Compared to the Brazilian 55-percent mean rate of formal jobs, the sugar cane industry's agricultural activities now have a rate of 68.5 percent (from the 53.6% of 1992). In the Center-South, the rate of formal jobs in sugar cane production (agriculture) is 82.8 percent, reaching 88.4 percent in São Paulo (2003).

• The differences in regional development are reflected in the industry's occupational indicators; poorer regions are characterized by lower salaries and a much larger use of labor, consistent with technological levels (automation, mechanization).

• In the early 1990's, there were 800,000 direct jobs; for every 1 M tons of sugar cane produced and processed, there were 2,200 direct jobs (73% in agriculture); in the North-Northeast, three times as much as in the Center-South. In São Paulo, non-specialized workers (sugar cane cutters) were paid US\$ 140 / month (amount at that time), which was higher than the amount paid to 86 percent of agricultural workers in general, and 46 percent of industrial workers. The mean family income of those workers was higher than that of 50 percent of all Brazilian families.

• The seasonal index for the job (sugar cane production) was 2.2 in São Paulo in the early 1980's, 1.8 in the late 1980's, and 1.3 in the mid 1990's. The decrease was motivated mainly by the mechanical harvesting of sugar cane, which enabled more training and career planning.

• In the late 1990's, with 650,000 direct jobs and 940,000 indirect jobs (plus around 1,800,000 induced jobs), the number of jobs per product unit in the Center-South region was still 3.5 times higher than in the North-Northeast; there is a correlation between the in the mean job quality (realted to years of education) and salary levels.

• The *formal, direct jobs* in the industry are now increasing in number (more 18% from 2000 to 2002), and reached 764,000 in 2002. Of those formally employed, 90.4 percent are aged 18 to 48 (0.3% under the age of 17). Jobs in agriculture decrease, while industrial jobs increase in number. People having studied for less than 4 years represent 37.6 percent of the workers, 15.3 percent of whom being illiterate (4% in the Center-South).

• Considering both formal and informal jobs (2003 PNAD sample), the income of working people in Brazil was as follows: all industries, R\$ 692/month; agriculture, R\$ 390/month; industrial operations, R\$ 671/month; services, R\$ 706/month; Sugar cane crops: Brazil, 821; N-NE, 283; C-S, 678; São Paulo, 797; Sugar industry: Brazil, 821; N-NE, 707; C-S, 865; São Paulo,

881. The amounts for ethanol are a little higher than those for sugar.

• In agriculture, the mean education level in the North-Northeast is equivalent to half the level (years at school) of the Center-South.

• In the Center-South, the income of people working in sugar cane crops is higher than in coffee, citrus and corn crops, but lower than in soybean crops (highly mechanized, with more specialized jobs). In the North-Northeast, the income in sugar cane crops is higher than in coffee, rice, banana, manioc and corn crops, equivalent to the income in citrus crops, and lower than in soybean crops.

• The income in formal jobs does not include the 13th salary or any benefit. Mills maintain more than 600 schools, 200 daycare units and 300 ambulatory care units. In a sample of 47 São Paulo-based units, more than 90 percent provide health and dental care, transportation and collective life insurance, and over 80 percent provide meals and pharmaceutical care. More than 84 percent have profit-sharing programs, accommodations and daycare units.

• Social Balance Sheet Indicators for 73 companies (UNICA, SP, 2003) show that funds equivalent to 24.5 percent of the payroll are used for such purposes as profit-sharing programs (6.72%), food (6.54%), healthcare (5.9%), occupational safety and health (2.3%), and education, capacity building and professional development (1.9%).

Appendixes

Abbreviations

APP	environmental protection area
BIG/GT	integrated biomass gasification / gas turbine combined cycle
CLT	Labor Code
CG	central power generation
СО	carbon monoxide
CO ₂	carbon dioxide
cec	ionic exchange capability
DBO ₅	biochemical oxygen demand
DG	distributed power generation
DM	dry mass
EIA	environmental impact evaluation
GHG	greenhouse gases
GMO	genetically modified organism
GNP	gross national product
GNV	natural gas vehicles
GRI	Global Reporting Initiative
HC	hydrocarbons
HTM	high test molasses
K ₂ O	potassium oxide
LPG	liquefied petroleum gas
CDM	clean development mechanism
MTBE	methyl tertio-butyl ether
MSG	mono-sodium glutamate
Ν	nitrogen
NGO	non governmental organization
NOx	nitrogen oxides
N ₂ O	nitrous oxide
OĪE	internal energy production
OM	organic matter
PCTS	cane payment based on sucrose
PNA	National Alcohol Program
PNAD	National Household Sample Research, IBGE
P_2O_5	phosphor oxide
PROINFA	Program for promoting alternative electricity production, MME
PV	photovoltaic effect
RAIS	Administrative Records of the Labor and Employment Ministry
R-CHO	aldehydes
RIMA	Environmental Impact Report
RMSP	Metropolitan Area, city of São Paulo
S	sulphur
SCYLV	cane yellow leaf syndrome virus
SAFCA	cane yellow leaf syndrome
SO ₂	sulphur dioxide

Appendixes

Entities, institutions, companies, etc.

ANVISA	Agencia Nacional de Vigilância Sanitária
CATI	Coord. Assistência Técnica Integral, Secretaria da Agricultura, S P
Cepel	Centro de Pesquisas da Eletrobrás
CONAMA	Conselho Nacional do Meio Ambiente
CREA	Conselho Nacional de Engenharia e Arquitetura
CTC	Centro de Tecnologia Canavieira
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária
EESC	Escola de Engenharia de São Carlos, SP
EPA	Environmental Protection Agency (EUA)
ESALQ-USP	Escola Superior de Agricultura Luiz de Queiroz, USP
FAPESP	Fundação de apoio à pesquisa no estado de São Paulo
FCE/UFMG	Faculdade de Ciências Ecionomicas, Univ. Federal de Minas Gerais
FEA-UNICAMP	Faculdade de Engenharia de Alimentos, UNICAMP
FGV	Fundação Getúlio Vargas
IAC	Instituto Agronômico de Campinas, SP
IBGE	Instituto Nacional de Geografia e Estatística
INEE	Instituto Nacional de Eficiência Energética
INPE	Instituto Nacional de Pesquisas Espaciais
IPEA	Instituto de Pesquisas Econômicas Aplicadas
ITA	Instituto Tecnológico de Aeronáutica
IPCC	Intergovernmental Panel on Climate Change
LMC	LMC International Ltd.
MME	Ministério das Minas e Energia
OIT	International Labor Organization
PUC-RJ	Pontifícia Universidade Católica – Rio de Janeiro
SMA-SP	Secretaria do Meio Ambiente, São Paulo
UNESP	Universidade Estadual Paulista
UNICA	Union of the Sugar Cane Agro-Industry in São Paulo
UNICAMP	Universidade Estadual de Campinas
WWF	World Wildlife Foundation

Unit prefixes

k	kilo (10 ³)
М	mega (106)
G	giga (10 ⁹)
Т	tera (10 ¹²)

Units

The metric system is used throughout the text, with the adequate prefixes.

° C	degree Centigrade
cal	calorie
CO ₂ eq	carbon dioxide equivalent (for global warming)
ha	hectare (104 m ²)
ppbv	parts per billion, by volume
ppmv	parts per million, by volume
t	metric ton (1000 kg)
toe	ton (metric) of equivalent oil (energy equivalent)
US\$(PPP)	Purchase Power Parity Exchange to US\$
V %	index of bases saturation