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Role of Institutions in Reshaping the Global Agricultural Landscape: Perspectives from Brazil

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I. Introduction:

World agriculture has shown an outstanding capacity to adjust to changes observed in modern societies. The traditional debate on the capacity of agriculture to respond to price incentives was dominant in the post war period. Agricultural economists focused the capacity of response of production and responses of technology to price incentives. This debate has moved away to focus other relevant questions as the rural-urban equilibrium, the new governance mechanisms of agro-industrial linkages, sustainability of agricultural production and impacts on stakeholders not always included in the traditional economic models to approach agriculture and development. World agriculture is changing imposing the challenge to adapt the global mechanisms to deal with growth and development.

The high economic growth, rapid urbanization and changing consumption patterns are the visible signals of a much deeper global adjustment rooted in how societies are dealing with its institutions, being this phenomenon largely neglected by economists, including agriculture and development economists. The role of institutions and organizations was not in the lenses of economists, including agriculture economists until recently.

Things started to change with the contribution of Ronald Coase and the new institutional economics to the analysis of modern organizations. Two aspects are of particular importance to this analysis. First is the relevance of institutions to shape the incentive structure the affect the decisions of economic actors, triggering economic development. This vein of analysis, as proposed by North(2005) that introduces a macro-institutional perspective. Second, is the impact of institutions in shaping the micro-structure of the economy. In other words how economic actors respond to changes in the institutional environment, to reorganize the way that complex contracts of production are organized (Coase,1991; Williamson,1996).

This is the analytical approach that I´ve chosen to guide the present analysis. This paper highlights the main changes observed in Brazilian agriculture and analyses the connections of the observed changes with impacts in global agriculture. My approach to the analysis that follows in this article focuses the main drivers of changes, where institutions play a central role. I will show that the driving forces observed in emerging economies that shape the global agriculture landscape are

basically explained by the competence of each country and international organizations, to shape market augmenting institutions. Old fashioned market interventions gave room for institutional building, which is a much more demanding and difficult initiative. Direct interferences in markets are usually less effective however are easy to implement, show short term and short living impacts and are politically attractive. To build institutions is a much more difficult task, there is a lot of ignorance about how to proceed, the results do not show immediately, but the outcomes are more long lasting and effective.

The present paper is focused on the analysis of three interconnected drivers of Brazilian agriculture within a global perspective. The drivers are; reorganization of global demand, socio-environmental variables, and the emergence of a new bio-energy paradigm each one having effects on the pattern of technological change in global agriculture. Each driver is approached based on institutional dimensions: First the capacity of markets to drive incentives for adjustments. Second the institutional incentives that are needed to complement and promote market adjustments, and third, stakeholders roles in promoting the reorganization of the agriculture landscape.

The paper is organized as follows. Part II discusses the three driving forces. Part three presents the conclusions and an analysis of the adjustments in Brazilian agriculture as a response to the driving forces showing how it connects to the global agriculture landscape. The paper has a forward view exploring the expected changes needed to deal with the new governance structures that shape modern agriculture.

II. Driving Forces in Emerging Economies:

The key proposition of the present chapter is that the driving forces act locally as well as globally and are not independent from each other. Each driver imposes the need of new institutional rules which result in different shapes of observed productive arrangements. There is not such a thing as a local driver of agricultural change in the modern global agro-systems.

Global Demand:

Food demand has changed dramatically on a global basis, mainly after the political reform in China and the economic growth in India and Brazil. It changed also as a response to food safety and quality concerns. Income growth is associated with increasing urbanization and changes in consumption patterns. At the same time the flow of agriculture products to Europe has been systematically restricted by the persistent protectionism that reflects the political strength of EU agricultural sector but also affects commodities and value added products originated from countries

like Brazil. In China the profile of food products needed is basically low cost vegetal protein to feed the local production of animal protein. The large proportion of income allocated in food consumption suggests that China will keep procuring food from low cost-large scale farming countries, being Brazil among the most important. Chinese policies towards African countries show a geopolitical approach of diversification of sources and also intents of direct investments in food production.

A different profile is observed in Europe, where high income consumers spend on the average small proportions of their incomes in food items. Consumers are willing to pay for specific food quality attributes related to sophisticated tastes and food safety requirements. New market requirements are becoming increasingly relevant and are related to difficult to measure food attributes. Examples are organic food, ethnic food, socially sound products, fair price markets, animal welfare concerns. They represent the pattern of new requirements of food characteristics that imposes particular technological restrictions. Consumers trends are also increasingly relevant as non-gmo´s, food miles, slow food and sustainable production technologies. The persistence of protectionism and the product demand profile are not the only reason, but are one of the reasons for higher food prices.

In Brazil food markets have been experiencing deep adjustments. First, due to the redistribution of income as resulted from governmental social policies. Second, due to market forces that resulted in higher salaries and formal labor markets growth. In smaller scale we can say that Brazil has to face the same problem as China, since a large proportion of its population is classified as low income and therefore spends high proportion of its family incomes in food items. Therefore food prices matter. At the same time a growing medium and high income population adopts European standards of consumption, adopting the same requirements related to food characteristics. The persistence of a double standard creates a problem faced by local regulatory agencies and also drives corporations to deal with multiple standard internal markets.

Macro-Institutional Adjustments: Important macro-institutional changes affected global food demand, with direct impacts on Brazilian agriculture. Any attempt to list the cases of institutional changes will result in partial view. Examples are; the economic reforms observed in China, the slow but important changes in Common Agriculture Policy in EU, the international mechanisms of trade promotion, particularly at WTO, the development of EU food standards, the evolution of an international system of intellectual property rights related to agriculture technologies. Each case has strengths and weaknesses, but each has had some impact on Brazilian agriculture. Also the way in which Brazilian institutions adapted

to the international frame, affected the strategies of international agro corporations.

The Chinese reform is particularly relevant since it opened room for the most drastic increase in global food trade expansion observed in modern history, with expected price effects. As observed by Weiming (2008,p.17), “China has limited potential to expand cultivated land areas and to increase water supply to agriculture”. This means that countries like Brazil that, in spite of the recent expansion of agricultural production, still explores only a small proportion of its agricultural land and has abundant water resources, represent a strategic economic player to establish long term commercial strategies.

Changes in European agriculture policies have signaled a small increase of exposition of EU agricultural sector to market forces due to the high proportion of budget allocated in farm support programs. Farmers have more freedom to choose what to produce shifting the large spectrum price incentives towards incentives directed to adoption of sustainable technologies, while maintaining the financial support. Access to markets is quantitatively relevant however the policy focus has shifted to quality instead of quantity. This links to the third institutional aspect, namely food standards.

The standards devised by the European food safety authority have significant international impact once it imposes technological restrictions to food exporting countries. European farmers had to adapt to new strict standards as well as global farming systems aiming to supply the European markets. How much the standards reflect new protectionist forms is a matter of debate, but they do have impacts on how international trade is organized, opening room for a new industry of certification labels.

The intellectual protection systems, mainly patents and plant variety protection evolved less efficiently than the profile of the new technologies. Once Brazil adopted UPOV rules for plant variety protection, it opened room for new private contracts arrangements, both among private and private-public institutions. However the high monitoring costs and the precarious systems of protection of intellectual property in the seed industry represents a serious problem that affects the way seed companies are doing business (Zylbersztajn et.al.2009).

Micro- Institutional Adjustments: The agro-fiber and energy systems have shown adaptations to the changing macro institutional environment. In Brazil very important evolutions have been observed, in many fronts. First the evolution of private complex organizations designed to deal with the increasing complexity of global agriculture requirements. More knowledge is needed to negotiate the

access to markets, and to adapt the production systems to the new technological restrictions.

In addition to governmental organizations to support trade negotiations the private sector awaken to the need of more participation in this arena. The result was the organization of privately funded economic research efforts designed to generate knowledge in support to the trade negotiations. Likewise the agribusiness chains and networks have developed sophisticated mechanisms to provide incentives for more intense coordination, needed to cope with technological regulations. Contract mechanisms linking agriculture and food processors evolved transforming the way that significant part of farm production and marketing are organized in Brazil.

Independent agriculture has shown fragilities to compete with horizontally and vertically organized networks that dominate the scenario of poultry, pork, sugar-ethanol, pulp-paper systems. Brazilian judiciary is being pressured to improve dispute resolution mechanisms to deal with the increasing relevance of contract-agriculture. As well as private dispute resolution and coordination mechanisms are being adopted in many food-fiber-energy supply chains. A new generation of managers is being hired by agriculture corporations in order to deal with the new and complex tasks.

Sustainable Agriculture Systems:

The reorganization of agriculture systems towards sustainable forms of production is a global trend that affects Brazilian agriculture. On the other hand the challenges faced in Brazilian tropical forest are unique and suggest the need for specific design of public policies. The country is particularly sensitive to the problem due to the existence of fragile natural biomas in its territory, not only the Amazon rainforest but also the cerrado in the central part of the country.

The international community plays a relevant role in promoting the incentives for adaptation, however not always based on information of good quality. The expansion of global agriculture production was made replacing natural areas by organized agriculture. This is the European, North American, Asian and African cases. It is not different in Latin America but just in the sense that the agricultural expansion has occurred later in time.

Brazil has three characteristics in terms of environment that are relevant for this discussion. First the southern states have a history of agricultural expansion reported from XVI century until the beginning of the XX century. Practically by 1950 all the land was occupied with farms in the south and southeast regions. During the

70´s the expansion to the west was observed opening the flat lands of the cerrado for agricultural production. The expansion has opened the opportunity for a significant internal emigration of southern family farmers toward the west, and later toward northeast, state of Bahia and, more recently towards north, to the states of Maranhão, Piauí and Tocantins.

<insert figure 1>

The total agricultural area in Brazil is estimated as 851 million ha, of which about 33% are actually in production. Most of the recent expansion of farming activities has been achieved by intensifying the adoption of technology and replacing low productive pastures by intensive and highly productive crops. Productivity gains and reorganization of farming areas represent the main potential of agriculture expansion in Brazil. However we observe continuous reduction in the Amazon rainforest area, creating a debate about the real causes of the phenomenon and the remedies to preserve the yet large proportion of the forest.

The Amazon rainforest is the most sensitive area in the country, since all figures show a gradual reduction in the forest, being replaced by farming areas mostly occupied with cattle. The need of regional development raises the question of how to deal with a large and remote area with a population of 20 million habitants. The human occupation is a reality and in fact follows the route of new roads being built in the area. The process raises a difficult to answer question, namely the definition of a national agenda to control the environmental depletion and at the same time allow the development of economic activity.

At the older agricultural areas, sustainability represents the same debate faced by developed countries in its farming areas. Important questions are the development of environmentally friendly technology, the evolution of market incentives for sustainable production and the evolution of governmental regulatory measures. The substitution of the industrialist paradigm of agriculture production for the environmentally friendly paradigm is a result of new technological development, new institutions and the organization of new production mechanisms. This process is going on in the center and southern Brazilian agricultural regions. Even in traditional farming states, recent reports show an increase in the area of forests (LUPA,2009).

There are three mechanisms to implement sustainable agriculture. The first is based on the market incentives that control the production technology, replacing non sustainable technologies. The second are the national and international regulatory measures that impose restrictions on environmentally unfriendly technologies. The third are the social mechanisms, well studied by Elinor Ostrom (1990), usually efficient when small scales and close knit groups are involved in

traditional production systems. In reality all three mechanisms operate simultaneously.

Market induced adjustments operate through mechanisms that offer premium prices to products coming from sustainable farming systems. There are several cases observed in Brazil as the FSC certified timber production, sustainable coffee and cattle. This is a relevant mechanism however does not solve the complex problem of limiting the misuse of natural resources and expansion of farming areas.

Governmental controls and regulatory measures play a central role to control the state of the world. Brazilian government and its legal institutional framework have defined strict measures that affect the potential use of resources, causing a vivid internal debate, since it interferes in the production possibilities of the agricultural sector. Brazil can be placed among the countries with the larger areas of Indian reservations, reservations of national forests and strict legal regulation for use of land. How effective and how costly are the governance mechanisms of the environmental apparatus, is a problem that is yet to be solve by Brazilian authorities. Good intentions might not be enough, in face of the economic pressures.

The three dimensions, namely; market (private), regulatory (public) and social, interact explaining the diversity of mechanisms observed in different parts of the country dealing with sustainability.

<insert table 1>

Macro Institutional Adjustments: The evolution of Brazilian institutions dealing with land use and environment is focused in two dimensions; i) defining and enforcing limits for agriculture expansion and ii) defining the formal property rights in the Amazon region issuing formal titles of property. The first point proposes different rules for different agricultural areas. As reported in table 1, figures show that 22% of the total area is defined as legal reservation and 26 % is defined as area of permanent protection. The first are state owned areas and the second are private areas with limited property rights for use.

< insert table 2>

Figures related to Brazilian agriculture occupation are reported table 2 and 3. The figures show that the total area of pastures represents 20%, soybeans 2.5%, other grain crops 5.5% and sugar cane 0.9% of the total area. The area dedicated to land conservation represents 67% of the total production area in the country and includes the categories of state owned conservation areas, private permanent

reserves and Indian reservations. Figures at table 3 show percentages related to the total agricultural land.

< insert table 3>

The debate of legal redefinition of property rights affecting the use of land is very intense. The actual proposal of a legal frame adds the areas of permanent protection (river banks and water springs) to the percentage of area not allowed to be cropped. The percentage of the total area that each farmer has to set aside is of 80% in the Amazon region, 35% in the cerrado and 20% in the south and southeast. That means that most of Brazilian farmers will have to reforest part of the farms, and no compensations is being proposed so far. A strong reaction of the National Federation of Farmers is carrying the debate. A definition is expected to be set by December of the current year of 2009.

Private mechanisms that have been designed are, in some cases, more limiting than the legal requirements. For instance, no cattle coming from Amazon region and no soybean can be traded based on private agreements of trading companies and meat processors. However it is legal to explore 20% of each property in the area. Therefore double standards need to be harmonized.

The definition of property rights plays a relevant role for natural resources preservation. Study of Alson, Libecap and Muller (1997) suggested the need of a more efficient governmental mechanism to supply and protect property rights in the region. The lack of legal titles is pointed as one cause of violent conflicts and is associated with forest depletion. Not only the supply of titles is relevant but also the quality of property rights matters. The naïve interpretations lead to false conclusions of causes of forest devastation as being placed on soybean growers or cattle farmers, being the underlying cause of institutional nature. The lack of definition and poor enforcement of property rights generates incentives for different parts to capture value that is placed in public domain. Illegal timber exploration, illegal mining and the industry of land occupation by squatters is the result of the lack of institutions. The natural forest suffers the consequences of depletion.

A governmental project designed in 2009 defined that a new structure of property rights on land should be implemented in order to generate positive incentives for sustainable production, in some way inspired by Hernando de Soto´s propositions. The focus of the policy is to offer titles to areas under 1,500 ha in order to formalize the large number of farmers that operate in the area but have no formal status. This is expected to trigger access to credit and promote development. Most relevant is to stop the perverse cycle of land invasions that are at the heart of the environmental problems observed in the region.

It can be said that Brazil presents one of the more aggressive projects of sustainability in agriculture in terms of definition of agriculture zones. The supply of property rights is an objective difficult to reach, but it has been perceived by the government as a bottleneck. Adding to the governmental regulatory measures, private mechanisms are also being adopted, as discussed in the next part of this chapter.

Micro-Institutional Adjustments:

International market forces are placing increasing pressure on the trade of products from recently devastated forest areas. This suggests that new coordination mechanisms of private players of soybean and cattle chains should be adopted to guarantee the environmentally sound origin of the products. A first initiative has been adopted by the soybean chain branded as the "soybean moratorium", which proposes that no soybean should reach the market if not originated from existing production areas. A similar proposal has been adopted by the cattle sector and beef industry in order to offer guarantee of origin of the product. International financial institutions as the International Financial Corporation and the local Development Bank (BNDES) have defined strict rules to make loans to the beef processing industry, mainly related with operations in environmentally sensitive regions.

Good intentions must be followed by costly mechanisms of coordination. What is observed now is the emergence of strictly coordinated mechanisms of governance of farming systems in Brazil. How the benefits and costs of such initiatives will be shared among the chain players, is yet an issue to be debated.

This trend adds to the arguments presented before that suggests that amplification of certification mechanisms to deal with non-observable product characteristics as environmentally sound technologies, socially fair production systems, not only in terms of quality of jobs but also dealing with stakeholders´ rights, and other attributes that need a credible certification label to inform consumers.

Bio-Energy Industry:

The third driver of global agricultural change is the growth of the bio-energy industry. Driven by high prices of non-renewable energy, the strategic option to increase the weight of bio-fuels in the Brazilian energy matrix is showing positive results. Two agro-energy chains are relevant for our analysis of the Brazilian case, ethanol and bio-diesel.

The ethanol industry is based on sugar cane, and can be considered the most traditional agro-industry in Brazil being the first investment made by the Portuguese settlers in the mid of XVI century. Sugar cane is grown in two main areas, in the northeast and, the largest production being carried in the southeast region. The expansion to the south is limited by climate conditions and to the west is limited by sustainability restrictions. Sugar cane production in the tropical rainforest area is not a technical and economical option.

Sugar cane high productivity performance is the result of consistent investments in research, both in genetics and in production technologies. The possibility to produce different forms of energy has been the key aspect of the sector considered holding a multi-product profile. The three products are, sugar, ethanol and co-generation of electric energy using sugar cane residuals after processing. There are three products from the sugar-cane mill. No longer considered a by-product, the energy produced from use of sugar-cane starch is treated as one of the products of the bio-industry.

The three different markets have very distinct characteristics. Sugar is a traditional product for domestic and international markets. Ethanol largely used by Brazilian automobile industry that adopted the flexible engine capable of using any proportion of fuel (gas and/or ethanol). Finally the market for electric energy represents an important addition to the hydroelectric and thermoelectric production for local markets.

The traditional analysis carried by the Brazilian bio-energy studies have stressed the soil and climate conditions, that are very adequate for sugar cane production. Also play a role the existence of a large industry of equipments for the sugar-cane mills and the continuous investments in agriculture technology. Not much has been said about the evolution of the organization mechanisms related to the capacity to coordinate the complex sugar-cane production chain.

The second vein of the Brazilian bio-energy industry is based on bio-diesel production. This option is totally different from the sugar-cane based bio-industry. On the one hand Brazilian government defined a social role for this industry as a public policy target due to its potential to include small family farmers in the bio-energy chains, based in supply contracts with the industry. On the other hand, soybean is a commodity that represents the most important source of more than 90% of the bio-diesel industry. In the case of soybean, the existence of a well established market for this commodity makes a preferable choice of the processing industry.

Macro-Institutional Adjustments: The history of evolution of the sugar-cane production for energy purposes dates back to the 70´s with the Brazilian alcohol program motivated by the first oil price shock. The goal was to promote the use of ethanol moved engines in the Brazilian automobile industry. It was as large governmental program that did not succeed due to the stabilization of oil prices, however the investments in technology made in agriculture and processing industry have been important for the evolution of flexible car engines, ad set the stage for the ethanol industry in the last decade.

The internal demand for ethanol grows steadily as the old gas moved cars are replaced by flex technology. Nowadays the preference of consumers is for the flexible cars. As reported in table 2, the area actually occupied with sugar-cane is of 0.9% of the total Brazilian area, or 2.3% of the total agricultural area. The expansion of sugar cane is being observed in substitution of low productive pastures that represent 58% of the total area available. Resources to increase sugar-cane production are abundant with minimal impact in environmentally sensitive variables.

The international market for clean sustainable ethanol fuel is yet a question to be defined. It is a function of national policies towards the protection of bio-energy from other sources, usually more expensive that sugar-cane produced in tropical regions. Also the future development of the second generation of ethanol production can affect the competitive position of countries that do not invest in this technology.

The design of a Brazilian program of bio-diesel was based on a mix of economic and social expected effects. The bio-diesel program has been designed based on three elements; a) First the definition of mandatory blends of diesel with progressive increase of certified bio-diesel production. The program started with 2% of bio-diesel in the blend and increases progressively the use of bio-fuel. b) Incentives for inclusion of small, low income, family farmers in the bio-chain, by offering tax incentives for processing industries that contract suppliers among small farmers. c) Engaging Petrobras, the Brazilian oil company, as an active player in the program, with direct investments in bio-diesel processing units, particularly in the northeast region where large numbers of small farmers are expected to receive incentives to engage in production.

Micro-Institutional Adjustments: Most of the studies of the recent evolution of Brazilian agro-energy programs have focused two aspects, first the governmental incentives and second, the technological development. Indeed these are relevant aspects that explain part of the evolution of this new driving force. I would like to explore a third variable that is the deep organizational evolution of the

mechanisms that govern the bio-energy chains. As expected these mechanisms have international effects for global agribusiness players.

New institutional arrangements of production in the ethanol industry have been observed. Since the processing industry needs to coordinate many complex simultaneous tasks, new contractual mechanisms have been developed to coordinate the linkages between industries and farmers. To create a transparent mechanism of negotiation between industries and farmers a contract board has been defined with limited participation of government. The "CONSECANA" is responsible to negotiate contract terms between farmers and processing industry, and once approved are generally adopted. The model is showing successful results and is being adopted by other agro-industrial chains.

The last decade was also marked by intense international investments in Brazilian ethanol industries. Nowadays the industry can be considered as having an international profile in terms of its structure of capital and several IPO´s have been successfully carried in recent years.

Differently from the sugar-cane, bio-diesel production system is new and is the result of direct public policy intervention that offers incentives both, at the demand and at production sides. Two agro-industrial sub-systems are observed. The first is based on non-traditional crops, although some have some history of local production as is the case of castor beans. This is a system dispersed in different regions, each region presenting a different profile of farmers and crops. The objective is to promote local development and upgrade the income level of farmers by the means of stable and long lasting contracts with processors. As expected, the process is characterized by high costs of transaction and many problems have shown at the initial years of the program.

The second is based in soybeans, a commodity system based on well organized markets. In the southern states as Rio Grande do Sul bio-diesel production is totally based in soybean. Small farmers also can contract with industries, however usually soybean is associated with large scale technology.

Stakeholders: The ethanol bio-industry has been under strong criticisms of different stakeholder groups. I will comment on three main aspects. The first debate has been observed in terms of the potential competition for resources to produce food or energy. The debate has gained room when the sharp increase in food prices has been observed at the international markets in 2008. The debate was not so intense when the food prices dropped close to what can be considered normal trends. Recent studies are pointing to the evolution of sugar cane in low productive pastures and also consider that sugar-cane areas cannot be

continuously farmed, but need to rotate with other crops. Therefore soybean and other legumes have actually shown an increase in production in sugar-cane areas.

The second criticism is related with sustainability of sugar-cane production. The intense demand for nitrogen, the use of water, the expansion towards environmental sensitive regions as is the case of Pantanal, the existence of a by-product from the industrial production process and the burning of the crop to allow labor intensive harvesting are issues usually placed on the discussion table by environmentalists. The agro-industrial system and governmental regulation are providing incentives for adoption of solutions based on the best available technology. Burning is regulated and is being replaced by mechanized harvest. The expansion of sugar plantations towards sensitive regions is being considered by investment banks in the analysis of projects of expansion.

The third critical aspect is related to social dimensions. First and most relevant are the labor conditions, since large numbers of temporary workers are needed. Second the relations of the industries with local communities need to be focused, since the activity might cause externalities, as the production of ashes during the harvesting season. The pressures for adoption of mechanisms to enhance labor conditions are present at the international sugar markets and are enforced by government.

As any other large scale agriculture activity, sustainability and social variables are aspects to be continuously addressed.

III. **Conclusions**:

The three driving forces considered in this paper have been: first the effects of global demand for food, fiber and energy; second the sustainability debate; and third, the bio-energy paradigm. Each force presents both local as well as global effects and they are obviously related to each other.

The changing profile of global food demand indicates that globally organized agricultural systems have to adopt to match new standards of quality and socio-environmental balance, as well as produce at a cost compatible with the needs of the society, particularly relevant for low income countries. What links local and global impacts is the cost impacts of the increasing regulatory measures as well as the food quality and safety standards. Brazilian agriculture shows a trend to reduce the variability of technologies towards more rigid production systems. Not only the technological standards are affected but also the regional specialization tends to change.

The sustainability dimension is already an effective driving force in Brazilian and global agriculture. Entire food, fiber and energy supply chains are adapting towards more sustainable technologies. Incentives are originated from market forces and national and international regulation. Sustainable technologies are followed by higher private costs, since externalities are incorporated in the production costs.

The bio-energy paradigm evolves rapidly as a result of oil prices but also resulting from public policies adopted in developed countries. If consumption standards adapt toward clean energy demand, then Brazilian experience should deserve more attention. Particularly developing nations can consider the model and the results of the bio-energy program in terms of improvement of social conditions of farmers.

Food, fiber and bio-energy systems tend to be globalized. It is increasingly difficult to identify closed systems that do not connect at some point with international dimensions. No local changes in agriculture are independent from global production and consumption structure. Double standards of food quality and safety tend to disappear. As new technologies spread over global farming systems, more global interests are embedded in the process. Basically new governance mechanisms of food, fiber and energy agro-based chains and networks need to be developed. Deeper interaction between local governments, multinational corporations and different stakeholder groups is expected to evolve.

The basic concept of landscape invites us to think in terms of an interaction between aspects rooted in natural as well as social dimensions, shaping the way we organized and affect the environment where we carry productive activities and where we live. It seems that we can no longer ignore the two way road that dominates the modern agricultural world. Interactions function in both directions, local and global.

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Tables:

Table 02: Availability of land and its use in Brazil (2007)

MILLION há			
Land available.	850		
Preserved areas and other uses *	510 (60 %)		
Total Arable (plowable) land	340 (40 %)	% of total land	% of Arable land
1. Cultivated Land: All crops	63.1	7.40%	18.6%
Soybean	20.6	2.40%	6.1%
Corn	14	1.60%	4.1%
Sugar Cane	7.8	0.90%	2.3%
Coffee	2.5	0.29%	0.73%
Oranges	0,9	0.10%	0.26%
Others	17.3	2.03%	5.08%

2. Pastures **	200	23.52%	58.82%
3. Available land(for agric and livestock)	77	9.05%	22.64%

Notes: * These areas include the Amazon rainforest, protected areas, preservation areas, reforestation, cities and towns, lakes, and rivers. **The pastures are composed of cultivated pastures, around 10% and natural pastures around 90%. Of the natural pastures a good part is degraded and could be converted to agricultural land. Sources: IBGE,CONAB and UNICA.

Figure1: Brazilian Regions and Land use Regulation

Source:

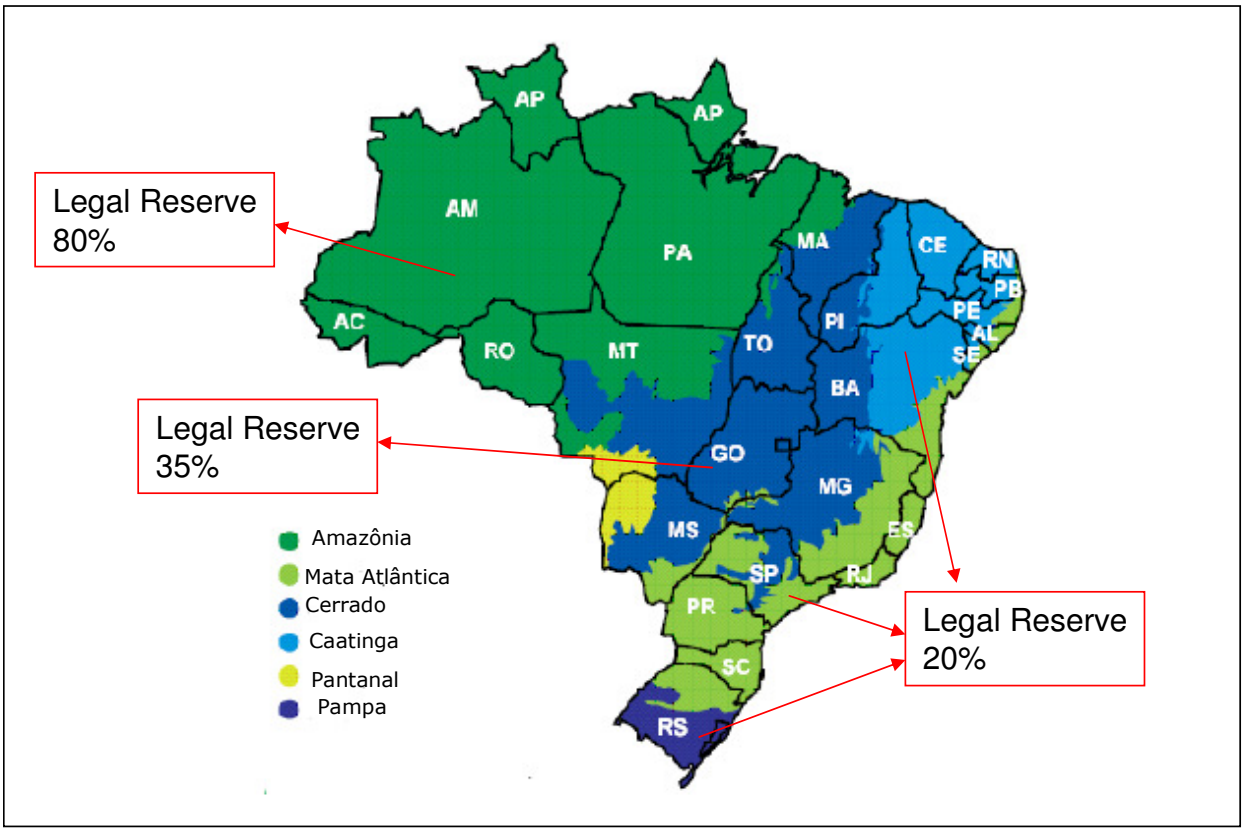

Table 1. Environmental Protection in Brazilian Biomas (1,000ha)

	Área	reservations	PP
LAND USE		**AREA**	**%total**
Amazon	419,515	116,504	148,737
Caatinga	84,383	14,013	9,866
Cerrado	203,071	39,440	28,500
Atlantic Forest	111,855	16,949	22,030
Pampa	17,689	2,979	2,250
Pantanal	*14,971*	0.069	14,982
Total	**851,484**	**189,954**	**226,385**
	100%	**22.31**	**26.59**

Source: Ministry of Agriculture

PP=permanent protection areas

	1,000ha	
Brazil total	851,000	
Pasture	173,000	20.0
Grains	47,000	05.5
Soybean	22,000	02.5
Sugar Cane	7,500	0.9
Total (includes urban destination)	280,000	33.0
Conservation	128,000	15.7
Legal Reserves	416,340	48.9
Permanent Protection		
Indian Reservations	120,000	12.7
Overlap Measures	226,387	-10.5
Total Legal Preservation		67.0
Source: Ministry of Agriculture		

Table 3: Agriculture use of land in Brazil. % of the total area.

Figure 2: