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SOYBEANS AS A MULTIPLE AND FLEXIBLE CROP

In terms of production volume, land use, and international trade, soy is among the most important crops in the world today. State- and agribusiness-led processes of agro-industrialization have profoundly expanded soy's frontier, such that over the past 60 years or so, global soybean production has increased by almost 1,000 percent, while the land area under soy cultivation has more than quadrupled (FAOSTAT n.d., USDA 2014). The United States became the world's leading producer, processor, and exporter of soybeans in the mid-20th century, and US-based companies still control most of its production technology and trade. Since the 1990s, however, there has been a dramatic shift in soy's political geography. South America's Southern Cone, where soy is the "the monoculture 'starlet' of the agro-export model", produces 57 percent of global soybean exports (Rulli 2007: 16, Oliveira and Hecht forthcoming). At the same time, East Asia is the leading consumer of soybeans from international markets, currently accounting for more than 65 percent of total imports, and surpassing European consumption since the year 2000. This new agroindustrial geography reveals much about the multiple and flexible uses of soy, and analyzing the history and political economy of these uses within and between Brazil and China – both key components of the global soybean complex – enables a more nuanced understanding of the current politics of 'flex crops' and agroindustrialization.

As a crop largely defined by the value and usefulness of its *co-products* – namely, soybean meal and soybean oil – soy might be regarded as a fundamentally flexible crop (see Borras et al. 2014). Of the world's total soy production, only 6 percent is consumed in the form of whole beans, tofu, or other whole-soy and fermented foods. The remaining 94 percent is crushed, either mechanically or chemically, to produce soybean meal and oil for further processing: a crushed bean produces about 79 percent meal, 18.5 percent oil, and 2.5 percent waste and hulls (HighQuest Partners and Soyatech 2011, WWF 2014). Worldwide, the meal portion of the crush is predominantly used in livestock feed (98 percent), while the remainder becomes soy flour and soy protein for food processing industries. Soy oil is largely refined as edible oil (95 percent), while the rest is funneled into industrial products, including biodiesel (Soyatech 2014).

Technically, these multiple industrial uses are possible because soy protein and oils can serve as a petroleum-replacement, contributing several other functions in chemical derivatives for use in manufacturing. Livestock feed and vegetable oil producers might source raw material somewhat flexibly between soybeans and other grains or oilseeds according to market price and availability. However, as soybeans become increasingly cheaper, better equipped for multiple uses, and more widely available than their alternatives, major soybean traders and crushers become strategically positioned to control downstream industries. Politically, soy's multiple-ness and flexible-ness is a consequence of the structure and operation of the global soy complex, which is controlled by a few major agroindustrial processing and commodity trading companies, some of which hold their position as legacies of North Atlantic-based agribusiness governance, with others emerging from new geographies and power relations.

Among these key agroindustrial actors, many anticipate a further expansion of soy's uses, and propose that such flexing will bring social and ecological benefits. For example, Gustavo Grobocopatel, head of the leading Argentinian soybean agribusiness Los Grobo, stated:

> What is to come in ten years is a sort of Green Industrial Revolution; plants begin to be transformed into factories. That is, a plant that until now produced grain begins to produce energy, bio-plastics, molecules and enzymes for industrial use... We are on the eve of an industrial revolution process of the same magnitude of the one that began in England during the 18th century, [but this] new revolution has some optimistic particularities: these plant-factories do not have chimneys, don't emit carbon dioxide but absorb it. These factories are friendly to the environment; they use renewable energy from the sun instead of coal or nuclear energy.[2]

Mr. Grobocopatel's statement is telling of how flex crops are being framed in agribusiness and development as a solution to the convergence of climate, energy, and food crises. But to claim 'sustainability,' these discursive representations rest on an incomplete accounting of energy and carbon cycles, and ignore the impacts of industrial agriculture. They also conceal the politics underlying a global food-feed-fuel complex, including the significance of flex crops in agroindustrialization and contemporary agrarian transformations. In order to understand these politics in relation to soy, we must understand the relationships between its multiple-ness and flexible-ness, the political economy of which is driving the soy processing industry globally, and the relationships both between crop 'flexors' – the powerful firms that control the soy complex – and with governments.

In addition to an analysis of the politics of flexing soybeans in China and Brazil, this paper also provides ideas and reference points for social movements to inform policy advocacy campaigns related to soy and its agribusinesses. Our analysis speaks to issues involving meat production, biofuels, consumer campaigns, labor movements, and BRICS more generally, and offers suggestions for future research that will further support these efforts.

SOY LEGACIES AND TRAJECTORIES: CHINA AND BRAZIL

There is no single path for 'flexing' an agroindustrial commodity like soybeans between food, feed, fuel, and other industrial uses. Similarly, there is no single path for soy transformations, as starting points, historical uses and legacies, and trajectories are different under different socio-environmental and political economic conditions. In this section we highlight changes in the soy sectors over the last four decades in China and Brazil, two key locations in the emerging corporate food regime and the shifting global soy complex. We show that the trajectories of soy developments in each country are related despite moving largely in opposite directions.

In China, soy has been transformed from a domestic crop with a long history of multiple food and farming uses, into the country's most important import crop, traded primarily to supply the industrial livestock sector with soy oil as a constructed co-market. Soy's diversity (of varieties and regions for cultivation) and multiple-ness (of use in diets and agroecosystems) in China has decreased, while efforts to recover the soy industry from the domination of foreign firms may be setting the stage for Chinese firms to become more powerful players among soybean 'flexors.'

In Brazil, on the other hand, soy cultivation developed relatively recently as a non-food cover crop, which was then incorporated into the vegetable oil industry, with livestock feed as the constructed co-market. Only after soy became a consolidated industrial input for the vegetable oil and livestock feed markets, have soybean-processing companies in Brazil begun to promote its use as a human food, a food processing additive, and biodiesel. These multiple and growing uses have increased the flexible-ness of operations for oilseed processors and grain traders in Brazil, while simultaneously reducing the flexibility in production decisions among grain and oilseed farmers, as well as the agrobiodiversity of Brazilian rural landscapes and diets.

We turn now to questions of control over soybean flexing, first through a historical analysis of soy developments in China, then in Brazil.

SOYBEANS IN CHINA: FROM FOOD TO FEED

Soybeans in China are defined primarily by *multiple-ness* in two senses: the historically multiple and diverse uses of soy in food and farming systems, and the contemporary multiple uses of soybean meal and soybean oil as co-products of the crushing industry. While soy foods and industrial soy applications are emerging, they are not (yet) at a scale that compels flexing away from livestock feed production. What's more, soy-based biodiesel is virtually non-existent. For these reasons, we argue that soy's *flexible-ness* in China is currently mostly speculation, as defined by Borras et al. (2014). However, this situation may change in the near future.

Early History: Soy as Food of the People

Soybeans originated in China, and millennial-scale cultivation of the crop produced around 6,000 domestic varieties and rich associated knowledges about soy production, processing and uses (Wang 1987). The northeast (Heilongjiang, Jilin, and Liaoning Provinces) is the historic center of soy cultivation, but soy is considered an agrifood staple and basic ingredient in Chinese cooking in general (Chang 1977).

Soy's versatility, or perhaps its *multiple-ness,* as a protein-rich food for humans explains much of its legacy in pre-reform China. As the "undoubtedly...most important diet adjunct" over the last six to seven centuries, (Mote 1977: 200), the many uses of soybeans before the 1990s reflected their dietary importance. For most of history, and for most Chinese people, diets were plant-centered, including "homegrown" soy (domestic or self-produced) as an important protein source[3]. To make it digestible, the soybean was almost always processed. Tofu has long been the most typical soy product, with co-products made into other dishes and snacks, and the liquids made into soy milk, and/or saved to be used later for cooking (Anderson and Anderson 1977). Soy flour was also common, especially in the northeast, to make starchy staples such as noodles, breads, and steamed buns (Wang 1987), and fermented products such as soy sauce, yellow and red soybean pastes, black beans, and pickled bean curd (Anderson and Anderson 1977). The particularities of these products – their characteristic form and flavor – varied by location, producing even more diversity.

Reform Era: Soy's Multiple-ness as a Casualty of Restructuring

Today, more soy is consumed in China than in any other place in the world, and in higher volumes than at any other time in history. But while foods like tofu and soy sauce remain common in Chinese cooking and diets, people now consume soy primarily in the form of industrial pork and chicken (fed with imported beans), and increasingly, as soy oil for cooking. The plant has been transformed from a protein-rich food for human consumption and a nitrogen-rich crop in domestic agroecosystems, into the country's most important agricultural import, primarily to fuel the industrial livestock industry. Soy's transformation began in the wake of Reform and Opening in 1978, and simplification of its uses continues to the present.

In the reform era (post-1978), a central preoccupation for China's political and economic elites has been 'modernizing' diets, including measures to significantly increase meat consumption for the urban middle and upper classes in particular (Schneider 2014). One of the state's earliest moves in this direction was establishing a milling industry to provide compound livestock feed for the budding industrial meat sector. Through a combination of market reforms and government financial support, China's feed industry went from practically nothing before 1975 (when livestock grazed or ranged in smallholder farming systems), to becoming the world's second largest feed producer by 1995, to its current position as a global leader. Pig feed was the first boom in the 1980s, followed by chicken feed in the 1990s (Ministry of Agriculture 2009). Today, China has a multi-billion dollar (US$) livestock feed industry, of which soybean crushing is a central component. As a result, China also leads the world in industrial pork and poultry production, and is rising in industrial beef and dairy production as well (IATP 2014).

Before soy could become a key ingredient in commercial livestock feed mixes, it had to be redefined as an *industrial* commodity[4]. In the 1990s, the government's decision to cut soy loose from state pricing control, while also maintaining stricter regulations on other sectors, was strategic. Although China had long been the world's leading soybean producer, harvests before liberalization were destined for tofu, soy sauce, and other multiple uses as described above. Increasing meat consumption became a more pressing goal for legitimizing the state and serving an emerging consumer

class, and in combination with anticipation of WTO accession, authorities liberalized soy imports while still encouraging domestic processing (Schneider 2011).

As a result of this sectoral restructuring in the 1990s, soybean imports have been soaring at an average annual growth rate of about 26 percent. In 2013, China imported 69 million tonnes, or 64 percent of the total global soy trade, predominantly from Brazil and the United States as seasonally complimentary suppliers (USDA 2014). Imported beans, which accounted for 85 percent of soy consumption in China in 2013, are crushed domestically to produce livestock feed (soybean meal) with soy oil as a co-product. A profound departure from soy's multiple-ness in China's past, these two agroindustrial uses now drive the country's soy industry, with global implications: China is the world leader not only in soy imports, but in both soy meal and oil production as well.

The 'Battle of the Beans,' Excess Crush Capacity, and Control Over Flexing

By adopting an import strategy focused on whole, unprocessed soybeans - and hoping to capture the products and profits of crushing, processing, and perhaps flexing soybeans at home - the state aimed to support China's participation in the global market without becoming its handmaiden. Yet despite these efforts, about 60 percent of the soy processing sector is foreign owned and operated. While this figure is quite high in comparison with other agricultural sectors in China (Schneider 2013), it has decreased from the 80 percent share multinationals had in the period immediately following the "2004 Soybean Crisis" (*2004 nian dadou weiji*), a watershed moment in China's soy sector (Bo 2014). The crisis began in the spring of 2004, when Chinese buyers pledged to purchase soybeans from the United States at a time when the price was abnormally high. When prices tanked by the time payments were due later that summer, many buyers defaulted on their contracts. Transnational soy traders took the case to GAFTA (Grain and Feed Trade Association) in London, which ruled in their favor: the Chinese crushers were required to fulfill their original contracts, despite substantial losses.

A Chinese Academy of Science study estimated that Chinese crushers overpaid for this soy by a margin of at least US$1.5 billion (Wen 2008). The immediate result was that many Chinese crushers and refineries were forced into bankruptcy, creating an opportunity for transnational agribusinesses to further penetrate the sector. The firms that made the most market headway after the crusher defaults were already leaders in the global soy trade: together ADM, Bunge, Cargill, and Louis Dreyfus bought out over 70 percent of the bankrupt Chinese crushers, and Singapore-based Wilmar also increased its market share (PRL.org 2009). Transnationals gained control in the soy oil market when half of all domestic refineries were forced to close. By 2009, foreign firms controlled 80 percent of soybean crushing and 60 percent of soy oil refining in China (PRL.org 2009). This meant that the same firms controlling soybean exports *to* China from production centers in the U.S. and South America were also the major *importers* controlling the flow of soy and soy products through the Chinese food system.

Referred to as the 'Battle of the Beans' in Chinese media, the 2004 crisis profoundly changed the trajectory of soy in China, and further shaped and was shaped by the North Atlantic domination of the global soy complex. In other words, the crisis ushered in an era of foreign domination in China's soy industry, followed by the contemporary era of domestic protection, recovery, and mounting overcapacity in the industry. Government support for domestic and state-owned firms in particular is an important strategy (Heilongjiang Agriculture News Network 2013). In crushing, although foreign firms own about 60 percent of the crush, the figure is somewhat deceptive: domestic firms own 72 percent of China's *total crush capacity*, (1) indicating the extent to which support and investments from state and private actors have boosted domestic mill construction and processing, (2) suggesting that the state wants to recover ownership and build processing infrastructure to compete with the ABCDs, and (3) highlighting the shifting trajectory of the industry in China and the soy complex globally.

In 2012, crushers in China processed 61 million tonnes of soy, which was less than half the country's capacity. This meant that China's crushers were operating at a level of excess capacity large enough to process Argentina's entire soy harvest (McFerron 2013). Most of the excess is in domestic firms, which have increased in number and size in the wake of the 2004 crisis (Nelson 2012). Table 1 lists the leading domestic soybean importers in China from 2013. Specific data on crush capacity in these firms is unavailable.

Box 1 The Beidahuang Group

The Beidahuang Group (北大荒集团) is a provincial state-owned agribusiness conglomerate, headquartered in Harbin in Heilongjiang Province. It is a potent example of the form and trajectory of some of China's leading domestic agribusiness firms, including their ability to control crop flexing.

Through its subsidiary company, JiuSan Oil and Fat Company Ltd., Beidahuang is China's third largest soybean importer and processor. JiuSan (93) has an annual crush capacity of five million tonnes, and is a national leader in production of livestock feed and cooking oil. Additionally, the firm is moving into markets for soy-foods, soy-based "health" foods, soy isoflavones, vitamin E, soy lecithin proteins, and soy-based medicines.

The management of Beidahuang is premised on maintaining a Chinese-controlled stake in the company, especially in the context of the 2004 crisis. Tian Renli, the group's CEO, stated publically that he would build a global purchasing network by himself, rather than let the group fall into foreign ownership and control (GRAIN 2012: 148). Indeed, Beidahuang is one of the Chinese firms currently involved in agreements for land and infrastructure abroad for soybean (and other crop) production (GRAIN 2014).

In addition to soybean processing, Beidahuang has operations in meat, dairy, rice, wheat, seed, cereals, pharmaceuticals, fertilizer, farm equipment and technology, foodstuffs, building materials, coal and gold mining, and other industrial applications (Beidahuang n.d.)

Overcapacity in China also impacts transnationals. In one sense, the foreign-owned share of the crush in China is declining. In another, Chinese companies are looking for ways to fill their unused capacity, through increased imports (Lloyd 2014), and notably, through investments in soy production and infrastructure abroad. The International Institute for Sustainable Development demonstrates that Chinese enterprises have sought investments in soybean production and related infrastructure in Brazil, Argentina, Bolivia, Kazakhstan, the Democratic Republic of Congo, Sudan, Zambia, and Russia (Smaller et al. 2012). The extent to which these investments impact the operation and power of the ABCDs and other leading transnational grain traders remains to be seen (Oliveira forthcoming).

Analysts predict that Chinese crushers will soon play a more central role in the global soybean *meal* trade, challenging Latin American crushers in East and Southeast Asian markets in particular[5] (McFerron 2013, USDA 2014). What's more, as Chinese firms – with the support of the state – continue to expand and

Table 1 China's leading domestic soybean importers, by rank, 2013

	Name	Main Activities	Ownership
1	Shandong Chenxi Group http://www.chinachenxi.com/	petrochemical production, grain and oil processing (soybean, palm oil, maize)	Private
2	Sinograin (China Grain Reserves Corporation) http://www.sinograin.com.cn/	storage, trade, processing, and logistics for grains, oilseeds, and oils (soybean, rapeseed, vegetable, sunflower, palm)	SOE
3	JiuSan (93) Group (subsidiary of the BeidaHuang group) http://www.93.com.cn/	soybean processing (#1 in China), soy oil refining (#3 in China), production of soyfoods	SOE
4	COFCO http://www.cofco.com/	foodstuffs (China's largest food processing, manufacturing, and trading firm), cultivation, finance, infrastructure, hotels, real estate	SOE
5	Sanhe Hopefull Grain and Oil Group www.hope-ful.com.cn/	primarily soybean processing (meal and oil), with future plans to add soy-based lecithin, vitamin e and other "high-tech health products"	Private (with party leadership)

Source: The Heilongjiang Agriculture Information Network (2013) is the source of the company ranking. Other information was compiled and translated by the authors from company websites.

Box 2 Ownership of Soybean Oil Retail Brands in China

The following is a list of the top 10 soybean oil retail brands in China from 2012:

1. Jinlongyu (金龙鱼)
2. Fulinmen (Fortune) (福临门)
3. ShengZhou (盛洲)
4. Panzhongcan (盘中餐)
5. Haishi (海狮)
6. Jinri (金日)
7. Riqing (日清)
8. Hong Qingting (Red Dragonfly) (红蜻蜓)
9. YuLan (豫兰)
10. Huaxiangnong (花香浓)

While most of these leading brands are owned by domestic companies, the world's leading soybean industry firms also operate in China's soybean oil sector, many with their own Chinese retail brands. Jinlongyu (金龙鱼) has 30-40 percent of the total market for all edible oils, the highest in China. Kerry Oils and Grains, which is owned by Singapore-based Wilmar, also owns its parent company, Arwana, Bunge started the Douweijia (豆维家) brand of soy oil in Nanjing in 2007. ADM and Wilmar have a joint venture in the Jinhai brand (金海) of products, including the Sania (莎妮雅) soy oil brand. Through a joint venture with China National Cereals, Oils and Foodstuffs Corporation (COFCO), ADM and Wilmar also own five companies of crushers and soy oil refiners. Cargill and Dreyfuss at present do not have their own retail soy brands, but instead sell unrefined oil to local refiners or to ADM enterprises.

Source: Chinese Forbes (2012) is the source of the top 10 list. Other information was compiled and translated by the authors from company websites.

meet their crush capacity, they will not only produce more soybean meal for domestic and export use, they will also produce more soybean oil. Currently, the domestic market for soy oil is nearly saturated. Before soy's rise, people in different parts of China used different kinds of locally produced vegetable oils for cooking (especially rapeseed and peanut oil). Vegetable oil was mostly a supplement to lard, the household production and use of which has declined in the context of swine sector restructuring (Schneider with Sharma 2014). But as soy imports and crushing have increased, so too has the amount of soy oil in need of a market. Given that the same firms that dominate crushing also dominate refining (both foreign and domestic), soy is now the leading cooking oil in retail markets. According to one soy expert in China, soy has all but replaced other oils in the country's vast landscape of restaurants and food stands.[6]

What economic models call "demand" for soy oil in China may continue in the short term, as the power of key firms continues to grow, and as it more completely replaces other cooking oils in urban and rural markets. But oil may also become an export for China, in a similar way to that which analysts predict for emergent soymeal exports. These are questions that remain open, and relate to ongoing restructuring in global soy crushing.

GMOs, Flexing, and Segmented Markets

Another important issue that impacts soy flexing in China is related to debates around genetically modified organisms (GMOs). In the wake of the 2004 soy crisis, officials used a number of methods to protect the domestic soy industry and recover some of the ground lost to foreign firms. These moves included: restrictions on foreign ownership in the soy sector, financial and policy support for new and existing Chinese agribusiness firms, minimum soy purchasing prices for domestic soy, and construction of a soybean futures market for non-GMO soybean trading (Schneider 2011, Zheng et al. 2012). This kind of market segmentation complicates the ease with which crops can be flexed, or, creates segmented, flexible markets.

Currently, China's central government prohibits commercial planting of GM food crops, but allows imports. Given that Brazil and the United States are the primary sourcing countries, virtually all of China's soy imports are GM, and are priced on the Chicago Board of Trade. Combined with the sheer volume of imports since the 1990s, these two issues have eroded China's domestic soy production, and are key processes in the dispossession of smallholder soy farmers. Since the 2004 crisis, soy acreage has declined nationwide

from 144 million mu (9.6 million hectares) in 2005 to 102 million mu (6.8 million hectares) in 2013. In Heilongjiang Province, the so-called "soy district" or "soybean's hometown" (*dadou zhixiang*), the area planted to soybeans has declined by more than half, from 6323 wan mu in 2005 to only 3105 wan mu in 2013 (Bo 2014). At the same time, experts estimate that more than 30 percent of smallholder soy farmers in the northeast have left farming to seek migrant labor in the cities (Ma and An 2010). Pricing here is key: there is no price premium for non-GMO soybeans in China; instead, growing non-GM soy is a liability for smallholders in particular, since their prices are undercut by cheap imported beans. According to Zhao Yusen of the National Committee of the Chinese People's Political Consultative Conference (CPPCC), "Hitting the Chinese soybean market with low-priced GM soybeans is part of a strategy used by transnational grain businesses to monopolize the Chinese soybean industry" (Hou 2013).

To address these issues, the Chinese Soybean Industry Association (CSIA) has proposed alternatives for the soy sector. Along with other experts, the CSIA urges China to develop new markets for domestic soy so that it does not compete directly with cheap GM imports. There are two main proposals. One is to use domestic soy exclusively in the manufacture of foodstuffs such as tofu, soymilk, and vegetarian products to be marketed within China. This proposal could also include marketing sustainable soy products to link producers to the growing domestic market for sustainable food products. Presently, there are a handful of Chinese firms using this model. The other proposal is to (re)develop the export market for non-GM soy to Japan, South Korea, European, and North American countries. Both of these proposals aim at separating the markets for domestic and imported soybeans to benefit Chinese producers and processors, who are likely to become the key soy flexors.

Box 3 Soy Industry Highlights: China and Brazil (2013)

China

China's soy imports as a share of total global soy trade	**66%**
Share of soy used in China from imported beans	**85%**
Share of soybeans in China crushed for meal and oil	**85%**
Share of soy crushing industry in China that is foreign owned	**60%**
Soy crushing in China as a share of total global soy crush	**28%**
Share of crush capacity that is domestically owned	**72%**
Excess crush capacity in China's soy industry (capacity: utilization)	**50%**
Annual crush capacity added by domestic companies from 2009-2010	**15 mil mts**
Annual crush capacity added by multinationals from 2009-2010	**7 mil mts**
Number of state-owned enterprises in the list of top 10 crushers	**6**

Brazil

Brazil's soybean exports as a share of total global trade	**41%**
Brazil's soybean exports as a share of total domestic production	**51%**
Soy crushing in Brazil as a share of total global soy crush	**15%**
Soy meal exported from Brazil as share of total domestic production	**52%**
Soy oil exported from Brazil as share of total domestic production	**23%**
Share of soybean production in Brazil used for biodiesel	**10%**
Excess crush capacity in Brazil's biodiesel refineries	**50%**
Annual crush capacity added by all companies from 2003 to 2008	**15 mil mts**
Annual crush capacity added by all companies from 2008 to 2013	**8 mil mts**
Crush capacity of Brazil's state-owned biodiesel company as share of total domestic biodiesel production	**28%**

Sources: FAOSTAT, USDA, Rabobank, ABIOVE, Aprosoja, Petrobras Biocombustiveis

SOYBEANS IN BRAZIL: AGROINDUSTRIAL INPUT WITH MULTIPLYING MARKETS

Compared to the millennial-scale legacy of soy in China, the crop's history in Brazil is much more recent, and with a very different trajectory. Soybeans were first planted for experimental purposes in Brazil during the late 19th century, and early Japanese migrants planted it for consumption as food during the early 20th century. Yet Brazilian commercial farmers only began planting soybeans in any extensive manner after the 1940s as a cover crop and green manure to restore nitrogen to soils degraded by wheat production (Hasse and Bueno 1996; Shurtleff and Aoyagi 2009). In other words, since there was no dietary habit of eating soybeans or soy foods outside immigrant Asian communities, the expansion of soybeans among commercial farmers in Brazil began as an addendum to wheat and other grain production. It was then incorporated into vegetable oil production and subsequently into livestock feed, which now drives the demand for the bulk of domestic soybean crushing operations. Since the 1990s, with the boom of soybean production in Brazil, the soybean crushing industry began to create new uses and markets for soybean products, especially biodiesel and food additives. Thus we recognize that real flexing is taking place in Brazil's soybean processing industry, and key corporate actors capable of flexing this agroindustrial commodity anticipate an even further multiplication of soy's uses.

From Cover Crop to Vegetable Oil and Livestock Feed

As production increased during the 1950s and 1960s, soybeans began to be incorporated as a supplementary input for the vegetable oil industry in Brazil, since its growing availability but limited commercial use made it significantly cheaper than alternative oilseeds available in southern and southeastern Brazil. However, the unfamiliarity of Brazilian consumers with soy oil and soy foods inhibited its uptake as the predominant ingredient for edible oil and margarine. According to the executive at Bunge responsible for marketing during the late 1960s and 1970s in Brazil, the company developed new brands of soy-based margarine – advertising one merely as "hydrogenated" but not admitting it was soy-based. Another was specifically developed for stove and oven cooking; a market in which they figured the consumer's concern over taste/scent would be reduced in relation to price. Sales boomed after 1976, when the company invested heavily in advertising on television, hiring a movie star that was featured in a major blockbuster that year as a lewd cooking instructor.[7] Since then, soybeans became the primary input for margarine production in Brazil, and gradually displaced other oilseed inputs in the production of vegetable oil. By 1986, soybeans were used in the production of 29 percent of all edible oil products consumed in Brazil (Paula and Faverete Filho 1998), a share that increased to over 86 percent since 2006 (Osaki and Batalha 2011).

It was only after soybeans became established as an input for the vegetable oil industry in Brazil that its use in livestock feed was developed as a way to generate profits from soy meal, the by-product of oil extraction that had previously been considered waste in Brazil. This late development of soy meal as an input for livestock feed was also a consequence of the relatively slow development of concentrated animal feeding operations (CAFOs) in Brazil during the 20th century. Until the 1970s, the vast majority of poultry and pork production in Brazil took place in small-scale, low technology, and geographically dispersed farms. Today, cattle ranching remains a predominant practice, although confinement prior to slaughter is increasingly starting to take place as well. Yet, since the 1980s, the concentration of the poultry and pork industries has become the single largest domestic market for soybean meal (Nicolau et al. 2001).

This process began during the 1970s, when the Brazilian state-owned agricultural research company EMBRAPA launched a program for the genetic 'improvement' of poultry and pork varieties to better survive in CAFOs and gain weight faster through soy-based livestock feed (Moraes and Capanema 2012). With these new varieties and the adoption of additional CAFO technology from the United States, large domestic companies like Sadia, Perdigão, and Ceval became major players in the Brazilian poultry and pork markets, as well as the soybean complex in southern Brazil. By 1995 these three companies collectively controlled 34 percent of the domestic poultry market and over 60 percent of Brazil's poultry exports, as well as 22 percent of the soybean crushing capacity in Brazil (Henry and Rothwell 1995).

After 1995, however, price support mechanisms and export taxes on unprocessed soybeans were removed, which favored the export of unprocessed soybeans

(as discussed above) and drastically reduced profit margins for soybean crushing operations. Consequently, poultry and pork companies divested from soybean crushing, which became increasingly controlled by the trading companies that deal with large volumes and thin profit margins. The share of Brazils soybean crush controlled by trading companies went from 22 to 43 percent between 1995 and 1997 alone (Paula and Faverete Filho 1998, Nicolau et al. 2001).

Soy production expanded very rapidly in Brazil during the 1990s, and by the early 2000s the sector was feeling increasing pressure due to overproduction. Consequently, the soybean production and processing sectors (led by the Brazilian Association of Vegetable Oil Producers, ABIOVE) began to seek out additional markets (and uses) for their products. The primary use found for soybeans in Brazil following livestock feed and edible oil has been biodiesel, and the most important new market for soy products has been the food processing industry.

From Edible Oil to Biodiesel

Soybean use as feedstock for biodiesel is understandably the focus of much discussion of flexing since it captures a larger portion of total soybean production than other industrial uses and it plays a very significant role in the articulation of agriculture with energy, environmental, industrial, and financial concerns (Borras et al. 2010, Holt-Gimenez and Shattuck 2009). Early experiments with vegetable oil as fuel began in Brazil as early as the late 1910s and 1920s (with a logic of import-substitution triggered by World War I disruptions and price hikes in international oil markets). However, it was only with the oil price shocks of the 1970s and the relative success of the government's Proálcool program for ethanol production from sugarcane stock that the federal government established the National Plan to Produce Vegetable Oils for Energy Use (Proóleo) in 1980. Yet, before soybeans and other feedstock could become significantly drawn into biodiesel production, the drop in world oil prices during the 1980s cut short the economic viability of the plan (Langevin 2010).

With the soy boom of the 1990s and pressure from ABIOVE for a new biodiesel program that could increase domestic demand from soybean crushing companies, the Brazilian government finally established the National Program for the Production and Use of Biodiesel (PNPB) in 2004. In the broader context of agrofuels and the energy matrix of Brazil, soy-based biodiesel still occupies a very minor role when compared to sugarcane ethanol, yet biodiesel production is by far the biggest market for soy products in Brazil after livestock feed and edible oil - we estimate that in 2013 about 10 percent of Brazil's soybeans went into the production of biodiesel.[8] It also illustrates new actors, new business logics, and new power relations associated with the restructuring of the soy complex and the politics of flexing (Box 4).

The PNPB mandates the mixture of biodiesel in Brazil's diesel supply. A mixture of 2 percent was achieved by 2006 and 5 percent by 2010, when biodiesel production substituted 1.1 billion liters of diesel imports, saving nearly a billion dollars from Brazil's international trade balance and providing 4 percent of the country's energy supply (Langevin 2010). In 2013, 2.9 billion liters were produced, and a mixture of 7 percent will come into effect on November 2014, raising the expectation that 4.2 billion liters will be produced in 2015 (Bianchini 2014). Current plans are for a 10 percent mixture to be achieved by 2020. The National Agency of Petroleum, Natural Gas and Biodiesel (ANP) approved ten more biodiesel refineries in 2012 and six more projects were under review that year. But growth of production capacity has far outpaced the demand for biodiesel, and the sector currently operates with 50 percent overcapacity (Nielsen and Lima 2013). Thus, ABIOVE continues to pressure the government to increase the biodiesel mixture mandate each year (Lovatelli 2014).

Although private agribusiness interests represented through ABIOVE have driven the government to create and expand the PNPB, the state plays a much greater role in the operations of the biodiesel sector. In order to implement the mixing mandates described above, the government guarantees purchase of 80% of the biodiesel market through public auctions held by the National Agency of Petroleum, Natural Gas and Biodiesel (ANP). It also directly produces biodiesel-refinery technology through EMBRAPA, finances their implementation through the National Economic and Social Development Bank (BNDES), and produces a substantial share of biodiesel through its state-owned company Petrobras.

The establishment of a soy-based biodiesel industry has also produced a segmented market that props some small-scale producers, particularly in southern Brazil, since the biodiesel program provides a "Social

Fuel Seal" with tax exemptions for private companies that source a certain percentage of their raw materials from small-scale farmers. This was intended especially for small-scale family farmers planting castor beans in the poor Northeast of Brazil (who were to be the archetypical beneficiaries of the "social inclusion" aspect of the PNPB according to the Brazilian government), but benefits were also extended to refineries that sourced at least 30 percent of their raw material from small-scale farmers in the South and Southeastern region (where small-scale soybean commercial farmers exist in substantial numbers), and 10 percent from the Center-West Region. However, the production of castor oil and other feedstocks by small-scale family farmers – especially in the Northeast of the country – quickly proved to be insufficient and poorly integrated by industrial logistics to attend the rapid demand that the biodiesel mandate created. Consequently, the biodiesel corporations that expanded their refinery capacity and collected the most benefits from the PNPB subsidies were those that sourced soybeans from small-scale soybean farmers in Southern and Central Brazil. This represents a notable failure of the biodiesel program in terms of social inclusion (Bernardes and Aracri 2011, Wilkinson and Herrera 2010).

Still, since 31 percent of current biodiesel production is sourced from small-scale soybean producers (Bianchini 2014), biodiesel production is establishing a geographically distinct and segmented market in which large-scale soybean companies in the Center-West attend the bulk of the biodiesel industry demand, while small-scale soybean farmers in Southern Brazil enable biodiesel refineries to capture the benefits from the "Social Fuel Seal" (Schneider 2009). Ultimately, the creation of such segmented markets might actually *limit* the flexibility with which soybeans are sought/contracted on open agricultural markets from interchangeable producers. Moreover, this limitation might also affect the soybean producers who increasingly lose control over their production processes to the companies contracting their crops.

It is also important to mention that the reduced emissions and other environmental benefits claimed by the Brazilian government and biodiesel companies are increasingly appearing to be equivocated. Considering the total emissions from agricultural production, land-use change, soybean processing and refining, and all the associated logistics of the soy-based biodiesel production chain in Brazil, reduced carbon emissions are negligible, while the additional environmental harms of industrial soybean production (e.g. soil erosion, water and soil contamination by agrotoxics, etc) are very significant. Accounting for the energy used by this production system demonstrates that biodiesel from soybean *cannot* be considered a renewable energy source (Cavalett and Ortega 2010).

> The future of biodiesel is very likely to be linked to the ability of clustering biodiesel production with other agro industrial activities at an appropriate scale and mode of production to take advantage of the potential supply of valuable co-products. [However,] if the biodiesel production systems are not carefully designed according to a *diversified small-scale perspective*, the intensive exploitation of land and fossil fuel for biodiesel production are more likely to generate environmental and social damages than to become a renewable energy source to society (Cavalett and Ortega 2010: 6, emphasis added).

Soy Foods in Brazil: a Market in the Making

Soy foods in themselves remain rare in Brazilian diets, with the exception of the Japanese-Brazilian community residing mainly in São Paulo and Paraná. Even though there is a rising number of young, middle-class urbanites who take up vegetarianism and favor soy foods as meat substitutes, there are still very strong and widespread cultural stigmas against eating soy foods in Brazil (Sousa and Vieira 2008). In fact, it is not uncommon to hear someone comment that "soy is food for cattle" to justify their unwillingness to eat the beans or its products. Tofu is generally called "soy cheese" in Brazil, which makes it hard for many to imagine cooking it into stir-fry or other common Asian-style meals. Soymilk, moreover, carries a negative stigma as a low-quality and low class substitute for cattle milk, because government programs for subsidized public school meals (and meals at other public institutions such as hospitals and prisons) took up soymilk as a nutritious and cheap alternative.

On the other hand, soy products are fast rising in Brazilian diets as inputs for food processing. Most notably, soy protein and oils are being added to processed

Box 4 Biodiesel in Brazil

The industry is concentrated both geographically in the leading soy-producing states, and also economically. The top four companies account for more than 50 percent of all biodiesel production in Brazil. They also illustrate the process of financialization associated with flexing (cf. Murphy et al. 2012, Borras et al. 2014), the emergence of Brazilian companies that are able to compete with major transnational corporations, and the key role of the state not only in establishing the biodiesel program, but also controlling a substantial amount of the sector through its regulatory agencies and major state-owned company.

Petrobras Biocombustiveis, a subsidiary of the state-owned oil company Petrobras, has a production capacity of 821.000m3 per year. It was established in 2008 and it was focused primarily in the northeast of Brazil, where it operates three biodiesel refineries. However, it nearly doubled its production capacity in a joint venture with the BSBIOS company that operates two refineries in southern Brazil, and it currently plans to expand in northern Brazil to incorporate palm oil and soybean production from the Amazon-Cerrado transition zone (particularly the states of Pará, Maranhão, Piauí and Tocantins). These shifts have taken place in large part because of the failure of expansion and integration of castor oil and other non-soybean feedstock for biodiesel production in northeastern Brazil. The company also further refines biodiesel into fatty acids, tocopherol, glycerol, and other chemical products.

Vanguarda Agro, with a production capacity of 640.000m3 per year, is an open capital company originally established as **Brazil EcoDiesel** by the US-based investment fund BT Global and Deutsche Bank, with 50% of its stocks controlled by investors from the Cayman Islands and another 50% controlled by Zartman LLC from California, Boardlock LLC and Carleton Towers LLC from Delaware, and Nelson Silveira (who worked with Carleton). It was then restructured with the integration of the Neo-Biodiesel Fund as majority shareholder (operated by the following financial institutions: Bradesco, Fibra, BMG, Bonsucex Holding, and Banco Fator) and became Brazil's leading biodiesel producer. In 2011 it merged with the agroindustrial company Maeda and the farmland investor Vanguarda Participações, changing its name to Vanguarda Agro and beginning a process of divestment from biodiesel production to focus on grain production. It is currently Brazil's largest private landholder, managing over 253 thousand hectares of farmland primarily in Mato Grosso, but it also leases land in Goiás, Bahia, and Piauí.

Granol is the third largest biodiesel company in Brazil, with production capacity slightly over 600.000m3 per year. It is a private company with anonymous and closed stocks, 58% of which appear to still be controlled by the family who founded it in 1965 in Brazil. Its operations are focused in Goiás, Rio Grande do Sul, and São Paulo states, and due to its ownership structure, there is significantly less information about it than the other major companies. In addition to soy meal, edible oil, and biodiesel, it also produces glycerol, lecithin, and tocopherol.

Archer Daniels Midland-Brazil (ADM) is the fourth largest biodiesel company in Brazil, with a production capacity around 300.000m3 per year. It is the Brazilian subsidiary of the transnational US-based ADM agribusiness conglomerate, which is centered around a major grain and oilseed trading company, about which much is already known (HighQuest Partners and Soyatech 2011, Murphy et al. 2012).

juices (apparently following a trend in Argentina) in increasingly large scales. Leading this tendency are the main processed box juice corporations operating in Brazil, whether they are domestic or transnational: Unilever has a major share of the Brazilian market with their *AdeS* box juice brand, alongside Nestlé (with *Sollys* juices), and the Brazilian companies Batavo (with *Naturis* juices) and Yoki (a Japanese-Brazilian company, with *Mais Vita* juices), among others. It is notable that the national Association of Soybean Producers (Aprosoja) has been actively campaigning for the adoption of juice-with-soy through legal lobbying and marketing. Physician and nutritionist conferences are also frequently attended by soy-lobby sponsored marketing professionals,

providing free samples of juice-with-soy and pamphlets about the nutritional qualities of soybeans. It seems clear that there is still a concerted effort to increase the acceptance and consumption of soy foods among Brazilians, targeting primarily the upper and middle classes, in part to gain a price premium through "high level" supermarket chains and brands, but also in part to deconstruct the stigma that "soy is food for poor people". Yet the non-food industrial use of soybeans is certain to remain the most important and fastest growing market for soy products after livestock feed, particularly through the increasing the mandates for biodiesel in Brazil.

IMPLICATIONS FOR SOCIAL MOVEMENTS AND POLICY ADVOCACY CAMPAIGNS

In the first of TNI's *Think Piece Series on Flex Crops and Commodities*, Borras et al. (2014) propose that an important question for social movements is, "What are the implications of the rise of a global flex crop complex for the way we frame (trans)national social movement campaigns for policy reforms?" (p. 12). Following this question, we suggest five areas related to the politics of flexing soy in particular for new or continued mobilization.

(1) Industrial meat.

First, the expansion of soybean agribusiness relies fundamentally on the idea that an agroindustrial production system is necessary to "feed the world" by increasing production volume and resource efficiency. Since livestock feed is currently driving the soybean complex boom, campaigns should continue to highlight the poor protein conversion rate of soy-fed livestock production, which also has multiple negative social and environmental implications (Schneider 2011, Schneider and Sharma 2013, Weis 2010; 2013a;b). The soy-oil-livestock complex very efficiently generates profits for the major companies that structure its transnational production networks, but is very *inefficient*, in fact it is outright counterproductive, regarding resource use for the production of human food. Campaigns like the *Meat Atlas* project should continue working to undermine corporate industrial agriculture's efficiency claims, while also advocating for less meat initiatives such as the *Meat Free Mondays* movement (Chemnitz and Becheva 2014).

(2) Biodiesel.

Biodiesel production represents the most advanced and problematic aspect of soy flexing. It also rests on imagined resource efficiency and intended social benefits that can be disproved. First of all, since biodiesel production provides a *virtually limitless market* for soybeans, it creates an upward pressure on food prices that directly contradicts the broader claims that agroindustrialization helps "feed the world." Besides, agribusiness and government promotion of soy-based biodiesel rests on incomplete accounts of resource use, while a thorough consideration of the soybean and biodiesel production networks demonstrates that these are only resource efficient when organized in smaller-scale diversified farming systems (Ortega and Cavalett 2010). Yet under current production systems in South America, which are controlled by major corporations and large-scale farms, both these intended environmental and social benefits have failed to materialize (Bernardes and Aracri 2011, Wilkinson and Herrera 2010). Finally, academic and policy circles in China have determined that soy is not an adequate biodiesel feedstock, and instead promote food and industrial waste oil or other cheaper and more efficient feedstocks (Scott and Jiang 2013). All these insights may be used to challenge the expansion of soy-based biodiesel production, and incite support for more socially and environmentally efficient small-scale diversified farming systems, even for the production of biodiesel.

(3) Public health and consumer campaigns.

A more challenging theme for social mobilization involves the health concerns over GMOs and the use of soy products in the food processing industry. These may be harnessed into broader campaigns against agroindustrialization and in favor of agroecology, particularly in China where food quality and safety are already major issues in public debate. This may also facilitate important alliances between rural and urban communities. The development of segmented markets that protect smaller scale and organic soy farmers in China and Brazil are a limited but valuable basis for some of these alliances. But even though some success was obtained in Europe and Africa with such campaigns, the same has not been the case in the United States, Canada, and Latin America (Schurman and Munro 2010). After all, consumer-based campaigns become easily co-opted and curtailed from engagement with the more fundamental problems and inefficiencies of the agroindustrial production process. It may also be

the case that flexing soybeans and other crops makes major agroindustrial companies more resilient to consumer boycotts (for example, the moratorium on soy from recently deforested areas, or a boycott of soy-based products), since they may substitute their inputs and alter their final products with increasing flexibility.

(4) Labor.

It remains to be learned in practice, but perhaps the increasing centralization of flex crop processing in large-scale multi-purpose facilities and tightly networked logistic systems might create strategic choke points for very effective worker strikes and other disruptions of agroindustrial production. The importance of such choke points for class struggle has been illustrated by the history of mining and railroad strikes during the 19th century (Mitchell 2009).

(5) Food sovereignty.

Finally, the fact that "local" companies from China, Brazil, and elsewhere in the Global South are increasing their power in this transnational production system does not necessarily translate into opportunities for soy farmers, agroindustrial workers, and consumers in these places. Unless greater food sovereignty and more diversified farming systems are vigorously promoted as the most resource efficient manner to attend social needs, disingenuous or ill-informed nationalism may be used to defend the emergent "soy flexors" against common interests.

CONCLUSION

Important gaps remain for further research, particularly regarding empirical information about the political economy and geography of the food processing and fine chemistry industry that increasingly incorporates soybean as a feedstock. Methodologically, we believe it is imperative to refine studies at the scale of processing facilities and companies. This enables investigation of questions such as: how flexibly do soybean crushers actually source their inputs between multiple soy varieties and other oilseeds? How easily may specific processing facilities and/or companies shift production between their soy-based products in response to market signals, consumer preference/campaigns, and worker strikes/disruptions? Does the multiplication of soybean uses, agroindustrial soybean varieties, and creation of segmented markets impose greater limitations on the flexibility with which processors source their inputs, or on the production practices of soybean farmers? How does the emerging politics of flexing soybeans alter the power and production relations between transnational agribusiness corporations, smaller agroindustrial companies, farmers and workers in the soybean complex, and consumers of soy-based products? Investigating these questions would contribute to the theorization of flex crops and commodities and the agroindustrial transformations of our century.

We intended to demonstrate that the significance of soybeans in agroindustrialization and contemporary agrarian transformations requires an understanding of the relationships between soy's multiple-ness and flexible-ness, the politics driving the soy crush in particular times and places, and relationships between key soybean flexors and states. On the last point, the agribusiness actors who are gaining more control over the global soy complex are doing so in part through flexing and/or by positioning themselves to gain even greater control over further and anticipated flexing.

As industrial livestock sectors continue to grow in China, and as the meatification (Weis 2007) of Chinese diets proceeds, feed production remains the primary force behind the crush. This is true even when the price for soybean oil is higher than meal, demonstrating the complex political nature of livestock and meat production, and consequently, of feed and flexing. Soyfoods and other manufactures are emerging in specialty markets, with firms like JiuSan (in English, "93," a subsidiary of Beidahuang) taking the lead in making soy-based snacks, drinks, and pharmaceuticals, as well as lecithins and isoflavones, from soy protein. These markets, however, are not yet significant enough for any substantial flexing. At the same time, biodiesel production, a central component in conceptualizing soy as a flex crop generally, does not involve soy as feedstock in China (Scott and Jiang).[9] For these reasons, there is currently not much flexing between whole beans versus crushed beans, or between multiple uses of crushed beans in China. This situation, however, may change in the near future.

In Brazil, on the other hand, the uses of soybeans were always associated with other agroindustrial production systems: first as a cover crop and green fertilizer for

industrialized wheat and maize production, then as an input for crushers that attend the vegetable oil and livestock feed markets. Agribusiness companies positioned at the center of the soybean production and processing complex have increasingly sought to expand and multiply markets for soybean products, including efforts to transform Brazilian diets to include soy foods and soy products as additives. The most significant new use for soybeans in Brazil has been biodiesel, which enables major agribusiness firms to effectively flex soybeans and other agroindustrial commodities between their multiple uses as food/feed and fuel. Given the central role of the Brazilian government in this process, we might venture to say that flexing soybeans has become state policy in Brazil, and further flexing is certainly anticipated.

These distinct legacies and divergent trajectories observed in Brazil and China are in fact converging through the creation of new actors, business logics, and power relations in the global soybean complex. As production shifts to Brazil and crushing to China, the large-scale agribusiness companies emerging from these countries – and the incipient partnerships they are beginning to establish with each other – have the potential to challenge the hegemony of North Atlantic-based agribusiness companies that have controlled the soybean complex for the past century. The ability to effectively flex soybeans and other agroindustrial commodities may ultimately determine the outcome of this global agroindustrial restructuring.

Notwithstanding competition among traditional and emerging agribusinesses in the soybean complex, more meaningful conflicts emerge between large-scale agribusinesses that can effectively flex soybeans (and other agroindustrial commodities), and smaller firms, farmers, and the rest of society. Biodiesel production, the most extensive soybean flexing at present, has been clearly shown to fall short of its imagined social and environmental benefits (Bernardes and Aracri 2011, Cavalett and Ortega 2010, Wilkinson and Herrera 2010). The unfolding dynamics of flex crops and commodities is an expression of the appropriation and substitution of biological crops for industrial processes that can render both raw materials and products more fungible in the interest of capital accumulation (Goodman et al. 1987). This contradictory process whereby a multiplication of uses of a single monoculture also reduces the diversity of agro-ecosystems, diets, and even cultural practices, ultimately increases our collective vulnerability to catastrophic pest outbreaks, price shocks and market volatility, food crises, and the ensuing social upheavals and rush for land, water, and other natural resources (Oliveira 2009). Most ominously, the agribusiness and financial corporations that are best situated to flex soybeans and other agroindustrial commodities are also the firms that profit and benefit the most from such market volatility and increased food prices (HLPE 2011, Murphy et al. 2012). Soybean flexing is already taking place in Brazil to a significant extent, and further flexing is anticipated in China, Brazil, and the rest of the global soybean complex. A more careful understanding of this process undercuts the optimistic arguments of leading soy flexors, and can help to reveal socio-environmental alternatives that move beyond the current agroindustrial fixation.

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Endnotes

1 Oliveira is a PhD candidate in the Department of Geography at the University of California at Berkeley. Schneider is an assistant professor of Agrarian, Food and Environmental Studies at the International Institute of Social Studies (ISS) in The Hague, Netherlands. We would like to thank the participants in the flex crops workshop organized by TNI in January 2014 at ISS in The Hague for their helpful discussions and insights.

2 Translation by Gustavo Oliveira from Martinez (2014), cf. Lovatelli (2014).

3 According to a survey by J.L. Buck, Chinese farmers before 1949 (in other words, most of the Chinese population) received 89.8 percent of their food energy from grains and grain products, 8.5 percent from roots, and only one percent from animal products (Hsu and Hsu, 1977). Similarly, the "Cancer Atlas" study from the 1970s upon which Campbell and Campbell's (2006) well-known "China Study" is based, reported that in rural China (again, the majority of the population at the time), only 9-10 percent of calories came from protein, and only 10 percent of that protein came from animal-based foods. Soy was a key protein source.

4 In 2002, the central government redefined soybean meal and soybeans as *industrial* rather than *agricultural* products, changing the tax and tariff structure, and promoting more liberalized trade (Solot 2006).

5 According to the most recent USDA (2014) report on oilseeds, China has already started to replace India's soybean meal exports in Asia, particularly to Japan, South Korea, and Southeast Asian countries.

6 Interview by Mindi Schneider, Heilongjiang Province, China, August 2011.

7 Interview by Gustavo Oliveira, São Paulo, Brazil, May 2014.

8 Estimate based upon ANP/ABIOVE data for total soy-based biodiesel production and the soy oil-to-biodiesel conversion ratio calculated by Cavalett and Ortega (2010).

9 Measures to support biodiesel include the 2006 Renewable Energy Law and the 2007 Long-term Renewable Energy Development Plan (*Baidu Baike* 2014).

AGRARIAN JUSTICE PROGRAMME

In recent years, various actors, from big foreign and domestic corporate business and finance to governments, have initiated a large-scale worldwide enclosure of agricultural lands, mostly in the Global South but also elsewhere. This is done for large-scale industrial and industrial agriculture ventures and often packaged as large-scale investment for rural development. But rather than being investment that is going to benefit the majority of rural people, especially the poorest and most vulnerable, this process constitutes a new wave of land and water 'grabbing'. It is a global phenomenon whereby the access, use and right to land and other closely associated natural resources is being taken over - on a large-scale and/or by large-scale capital – resulting in a cascade of negative impacts on rural livelihoods and ecologies, human rights, and local food security.

In this context TNI aims to contribute to strengthening the campaigns by agrarian social movements in order to make them more effective in resisting land and water grabbing; and in developing and advancing alternatives such as land/food/water sovereignty and agro-ecological farming systems.

Agroecology by the Filipino painter ***Boy Dominguez****, 2013*

TNI Think Piece Series on Flex Crops & Commodities

The convergence of multiple crises (food, energy and fuel, climate and financial) in the midst of the rise of newer hubs of global capital (BRICS countries and some middle income countries) – and the various responses to these by states and corporations – have paved the way for the emergence of 'flex crops and commodities'. Flex crops and commodities are those that have multiple and/or flexible uses: food, animal feed, fuel, and other commercial-industrial uses. In fact the contemporary global land rush is intertwined with the rise of flex crops and commodities: sites of large-scale land deals tend to be sites of expansion of production of these crops and commodities, e.g. soya, sugarcane, palm oil, corn, cassava, industrial trees. What are the implications of this phenomenon for how scholars, civil society and grassroots social movements undertake 'engaged research', public actions and policy advocacy around agrarian justice issues? The issues are compelling and urgent, yet still largely under-researched. TNI is launching the TNI Think Piece Series on Flex Crops & Commodities to jump-start collaborative action and a critical dialogue between engaged academics, civil society and grassroots movement activists on this issue.

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Soy might be regarded as a fundamentally flexible crop. It is defined largely by the multiple uses of its co-products – soy meal and oil – used primarily for livestock feed and edible oil, and further refined into multiple processed food and industrial products, especially biodiesel. This millennial Chinese food crop has become a key agroindustrial commodity in the world today. At the center of an integrated global soy complex are US-based transnational corporations that dominate soy technologies and markets around the world. But as production shifts to Brazil and processing to China, new actors, business logics, and power relations emerge. At the same time, the ability to effectively flex soy and other commodities plays an important role in global agroindustrial restructuring, since not all actors can benefit from these dynamics. By tracing the divergent histories and uses of soy in China and Brazil, we examine the politics of flexing soy, and offer ideas and reference points for social movements to inform related policy advocacy campaigns.

Keywords: flex crops | soy | agribusiness | biodiesel | meatification | livestock-feed complex | China | Brazil