

Disappearing nature? Agribusiness, biotechnology and distance in Argentine soybean production

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A recent trend identified in the agro-food literature is that financialization in the global food system is further increasing the distance between farm and plate as well as abstracting physical commodities into market derivatives. How does food, a basic material need, become a commodity, a financial asset divorced from its physical form? This contribution explores the growing distance and abstraction of food from farm using Argentina's soy model as a case study. I explore the various drivers of distancing across the soy value chain in Argentina, including industrialization, globalization, corporatization and finance. I argue that the push for technological innovation by large-scale agribusinesses, in articulation with financial sector involvement, are both an example of and are instrumental in the process of distancing and abstraction identified in the agro-food literature. This paper also highlights how, despite agribusiness efforts to 'displace' and 'disappear' nature, these processes are never fully accomplished. I thus reflect on the socio-ecological contradictions that arise from the processes of distancing and abstraction which accompany the financialization of the corporate food system under neoliberal globalization.

Keywords: Argentina; soybeans; agribusiness; financialization; distance; GMOs; biotechnology

1. Introduction

The biotechnology of genetically modified (GM) seeds is portrayed as the solution to a most pressing crisis: How to feed the world with increasingly scarce resources on an overpopulated, overheated planet (James 2014). In Argentina, the third largest global grower of GM crops (James 2014), this discourse has taken root (see Newell 2009). Agribusiness leaders express pride that, thanks to the adoption of the technological package of GM soy, Argentina has become a key global food producer (Grobocopatel 2010). On the other side, critics argue that the GM soy model is causing harmful effects on society and the environment (Giarracca and Teubal 2010). The humanitarian discourse of agribusiness masks the fact that technological innovation in soybean production, like the agro-industry in general, is motivated by profit maximization (Magdoff, Foster, and Buttel 2000; Magdoff and Tokar 2010). Soybeans have become particularly lucrative since the turn of the twenty-first century, as global demand grows and commodity prices rise (Teubal 2006, 2008). The trade – and growing speculation – in soy as a commodity in the global financial market puts into question the agribusiness claim to increase soy production to feed the world (Russi 2013).

How does food, a basic material need, become a commodity, a financial asset divorced from its physical form? This contribution explores the growing distance and abstraction of

food from farm using Argentina's soy model as a case study. In the agro-food literature, 'distance' refers to the separation between farm and plate: the disconnection between decisions over natural resource use and over consumption (Kneen 1993; Princen 1997, 2002; Clapp 2014, 2015). This distance may be geographical (for example, when grapes are produced in Chile but consumed in the United States) or cultural, when consumers are ignorant of the social and environmental impacts of food production (e.g., when US shoppers are shielded from knowledge about the labor conditions of the grape growers).¹ In our globalized food system, farm-to-plate distance continually increases as multiple actors form new links in the commodity chain (Friedmann 1994; McMichael 2013). Increasing distance increases power asymmetries between producers and consumers, which allows producers to externalize and render invisible the social and ecological costs of their decisions (Princen 1997, 2002; Gould 2006).

As Clapp (2014, 2015) observes, the entry of financial capital into the global food system compounds 'distancing': financial actors and institutions – such as banks, hedge funds and mutual funds – enter commodity chains with a primary goal not of food production but of generating high returns. In financial markets commodity trading is devoid of real commodities; goods are not physically exchanged as they would be in, say, a local farmers' market. Derivatives, financial assets that derive their value from the performance of other underlying assets, are the extreme disembodiment of commodities (Russi 2013). This is how heightened financialization of agro-food systems 'abstracts' physical commodities and exacerbates distancing (Clapp 2014, 2015; Isakson 2014).

In the last two decades, Argentina has positioned itself in the global food system as a strategic provider of soybeans for the livestock complex (Teubal 2006, 2008; McMichael 2013). This is the result of a process of neoliberal agrarian restructuring that took place in the 1990s and accelerated drastically with the introduction of Roundup Ready™ (RR) soybeans in 1996 (Teubal 2006). Multinational seed and agrochemical giant Monsanto engineered RR soybeans to tolerate spraying with the glyphosate-based herbicide Roundup, which it also manufactures. The 'technological package' consists of planting RR soybeans using a no-tillage method and spraying with glyphosate as a primary weed killer. Argentine farmers were early and rapid adopters of the technological package of GM soy (Trigo and Cap 2003). Nowadays, 100 percent of soy planted in Argentina is RR (Trigo 2011).

The consequence has been a soy boom. Since 1997, an average of 726,000 hectares have been added to soy production yearly, reaching close to 20 million in 2015, or 52 percent of Argentine land under cultivation (MAGyP 2015). Record harvests have also been reported each year (Leguizamón 2014a), peaking at 61.4 million tons in 2015 (MAGyP 2015). Yet this production is not for domestic use. Ninety-six percent is exported as beans, meal, oil or biodiesel (ACSOJA 2015), making Argentina the third largest global producer and exporter of soybeans, after the United States and Brazil (USDA 2015).

At the forefront of this agrarian transformation is a relatively new actor in Argentine agriculture, 'sowing pool' agribusinesses (Murmis and Murmis 2012; Gras and Hernández 2009b, 2013, 2014). Sowing pools are collective investment funds for large-scale soy production that operate in Argentina and other South American countries, like Uruguay, Paraguay, Bolivia and Brazil. These agribusinesses have revolutionized Argentine agriculture

¹As David Harvey (1990, 423) notes, 'The grapes that sit upon the supermarket shelves are mute; we cannot see the fingerprints of exploitation upon them or tell immediately what part of the world they are from'.

by promoting a new ‘paradigm’ of agricultural production based on novel arrangements for land and labor and constant technological innovation (Hernández 2009; Gras and Hernández 2009b, 2013, 2014).

This paper explores the various drivers of distancing across the soy value chain in Argentina, including industrialization, globalization, corporatization and finance. I argue that the push for technological innovation by large-scale agribusinesses engaged in soy production, in articulation with financial sector involvement, are both an example of and are instrumental in the process of ‘distancing’ identified in the agro-food literature (Kneen 1993; Friedmann 1994; Princen 1997, 2002; McMichael 2012, 2013; Russi 2013; Clapp 2014, 2015; Isakson 2014). I contribute to the agro-food literature by showing how the processes of distancing and abstraction happen from the ground up, starting with the farmer in the field. By exploring how labor, class relations and agricultural production are changing as a consequence of the cultivation of GM soy in Argentina, I trace the increasing distance between the farmer/producer and the food/product. This distance transforms agriculture from a food-producing activity into a commodity and, eventually, to a stock in the financial market. My case study provides empirical support for a trend recently identified in the agro-food literature whereby agriculture goes *beyond* the commoditization of food (and land) toward the utter dematerialization, decontextualization and financialization of nature (McMichael 2012; Russi 2013; Clapp 2014, 2015; Isakson 2014; Fairbairn 2014; Lawrence 2014).

This paper also highlights how, despite agribusiness efforts to ‘displace’ and ‘disappear’ nature, these processes are never fully accomplished. On the contrary, I show how these efforts are still very much rooted in physical bodies, resources and practices, and thus serve capitalist expansion by a process of accumulation through dispossession (Harvey 2003; Araghi 2009; McMichael 2012). Soybean production in Argentina relies on extensive agro-industrialization, a form of dispossession (Cáceres 2015) with growing social and ecological costs (Leguizamón 2014a, 2014b). In Argentina, the expansion of GM soy monocultures has been associated with violent peasant displacements (Lapegna 2013); increased cancer rates in rural and peri-urban populations due to agrochemical exposure (Berger and Ortega 2010; Carrizo and Berger 2012; Lapegna 2015); food insecurity (Teubal 2008); deforestation (Grau, Gasparri, and Aide 2005; Gasparri, Grau, and Gutiérrez 2013); soil nutrient depletion (Pengue 2005); and water, air and soil pollution (Binimelis, Pengue, and Monterroso 2009). Yet vast distance in a financialized global food system allows producers to disguise these costs (Princen 1997, 2002), making it hard to link the aforementioned consequences with the responsible parties (Gould 2006), and hence complicating the context of resistance (Clapp 2014).

For this work, I draw data from press sources, reports, websites and statistical databases, as well as 40 interviews conducted between 2009 and 2012 with Argentine rural actors, including peasants; rural workers; small, medium and large soy producers; rural contractors; and stockholders, chief executive officers (CEOs) and employees of sowing pool agribusinesses; in addition to rural inhabitants who do not profit directly from soy production. Following this introduction, I describe the context of soybean production in Argentina, focusing on the national and transnational links of the soybean chain. Sections 3 and 4 focus on socio-ecological change and inquire into how technological innovation transforms social relations and society-ecosystem dynamics (Schnaiberg 1980; Schnaiberg and Gould 1994; Gould, Pellow, and Schnaiberg 2008). In section 3, I show how the process of distancing starts on the farm. Here I look at how the adoption of new technologies removes physical labor from agriculture and contributes to distance and the commodification of food production. In section 4, I focus on how large sowing pool agribusinesses utilize

technology to reduce their dependency on the natural conditions that make agriculture possible, most significantly land and labor. Thereby, agriculture is transformed and nature is, allegedly, ‘displaced’. In the conclusion, I reflect on the socio-ecological contradictions that arise from the processes of distancing and abstraction which accompany the financialization of the corporate food system under neoliberal globalization (Harvey 2003; Araghi 2009; McMichael 2012, 2013; Clapp 2015).

2. The context of soybean production in Argentina

RR soybeans were approved for use in Argentina in 1996, making Argentina one of the first six countries to adopt GM crops for commercial use (James 1997). The introduction of GM biotechnology was the next obvious step in a history spanning two centuries of agrarian capitalism and technological innovation in the Argentine Pampas (Barsky and Gelman 2001; Hora 2012). The Pampas are a lowland central region extending across the provinces of Buenos Aires, La Pampa, Córdoba, Santa Fe and Entre Ríos. This region is characterized by vast plains of fertile land, and temperate weather, making it ideally suited for large-scale agriculture.

The Pampas have played the starring role in Argentina’s rural export sector and served as the motor of its economy ever since Argentina gained independence from Spain in the early 1800s (Hora 2012). Starting in the 1880s, agricultural exports – primarily wheat, corn, flaxseed and livestock – contributed to building Argentina’s *belle époque*, a time when Argentina matched the newly independent countries of Canada and Australia in growth rates and living standards. This first agro-export boom, which bust with the Great Depression of the 1930s, resulted from the expansion of the agrarian frontier over indigenous territory and from the introduction of agricultural machinery – mowers, harvesters and threshers – from the United States and Canada (Hora 2012). Pampas farmers, mostly newly arrived European immigrants, modeled their agrarian production after American capitalist agriculture, a model based on the constant modernization of agrarian technologies and methods and a focus on increasing productivity to yield short- and medium-term profits (Barsky and Gelman 2001; Gras 2009; Hora 2012).

Soybeans entered the Pampas in the late 1960s alongside the technologies of the Green Revolution, such as hybrid seeds, agrochemicals and tractors. Productivity increases resulting from the adoption of such technologies enabled the Pampas to recover its place as the motor of Argentina’s economy via exports of oilseeds and grains (Barsky and Gelman 2001; Hora 2012). From the late 1990s onwards, soybeans became Argentina’s ‘star crop’ (Hora 2012, 169), due to the introduction and rapid diffusion of the technological package of GM soy in a context of neoliberal economic restructuring (Teubal 2006, 2008; Newell 2009; Leguizamón 2014a).

Argentina’s neoliberal restructuring, a process that started with the military dictatorship in the late 1970s and accelerated swiftly in the 1990s, entailed the return of an outward-looking development model based on nontraditional commodity exports. Facilitated by a global context of high prices and high demand, mostly from Asia, GM soy became farmers’ preferred crop and the government’s key accumulation strategy (Teubal 2006, 2008; Newell 2009; Leguizamón 2014a). The result was an unprecedented expansion of production – linked not necessarily to higher yields, but rather to larger areas under cultivation due to crop replacement and expansion of the agrarian frontier – followed by a growth in exports (Leguizamón 2014a). Between 2002 and 2012, soy and soy-derived exports (beans, meal and oil) represented, on average, 23 percent of Argentina’s total international trade (Simoes 2015). In 2014, soy sector exports

represented 28 percent of total Argentine exports and accounted for USD20 billion in foreign income (INDEC 2015). The year 2015 has seen a downturn in soybean prices due to falling oil prices: in September 2015 soybeans reached their lowest price since late 2008, at USD324/ton, compared to a peak of USD650/ton in September 2012 (*La Nación* 2015a, 2015b). The 2015 economic crisis in China, a primary buyer of Argentine soybeans, has further jeopardized the Argentine soy boom.

2.1. The soybean chain

The neoliberal restructuring of the 1990s led to a reorganization of Argentine agriculture to provide primary inputs for the global food system (McMichael 2013; Gras and Hernández 2014). As Otero (2012) notes, neoliberal restructuring in Latin America has led states, as instrumental actors, to promote the adoption of GM biotechnology as well as new regulations based on market principles that benefit large transnational corporations. In Argentina, the consequence has been that the soybean agro-export complex has become a privatized agribusiness regime dominated by national and transnational corporations (McMichael 2013). In what follows, I summarize the transnational links of the soybean chain in Argentina. As Friedmann (1994) argues, transnational agro-food chains contribute to distancing and blur the boundaries of production and consumption across sectors and across nations.

The global soybean chain is controlled by a handful of transnational corporations: the top six seed and agrochemical companies (Syngenta, Bayer, BASF, Dow AgroSciences, Monsanto and DuPont) control 76 percent of the global market share (ETC Group 2013). Four grain traders (ADM, Bunge, Cargill and Louis Dreyfus) control around 75 percent of the export market (EcoNexus 2013). Although these four firms, known as the ABCDs, still dominate world trade, Asian trading companies such as COFCO are emerging as important competitors in Latin American soybean production (Murphy, Burch, and Clapp 2012). The ABCDs together lost almost 20 percent of the Argentine soybean export market between 2005 and 2014, from 62.6 to 40.6 percent. Half of these lost exports were captured by the Chinese firm COFCO via its control of Nidera and Noble Group, which jointly account for 11.3 percent of 2014 exports (*Clarín* 2015).

ADM, Bunge, Cargill and Louis Dreyfus are multinational giants that also monopolize worldwide soybean processing capacity (USSEC 2011). The soybean milling and processing sector is highly concentrated as well, and shows upstream and downstream links across the production chain, from providing inputs and controlling purchases to farmers to dominating export sales (USSEC 2011). Through strategic alliances and joint ventures (e.g., Cargill with Monsanto, Bunge with DuPont), the four giant trade companies extend their grip on the value chain to the seed and agrochemical sector and thus control the entire global food system (EcoNexus 2013; ETC Group 2013).

The soybean chain in Argentina reflects the global trend of increased concentration and integration (Regunaga 2010; Turzi 2010). A small number of national and transnational companies monopolize the trading sector. Seven firms (Cargill, Noble, ADM, Bunge, Dreyfus, Toepfer and Nidera) control 85 percent of soybean exports. Eight firms (Cargill, Bunge, Dreyfus, AGD, Molinos Río de la Plata, Vicentín, and ADM) control 89 percent of soybean oil exports. Seven firms (Cargill, Bunge, AGD, Dreyfus, Molinos Río de la Plata, Vicentín and Nidera) control 92 percent of soybean protein meal exports (Regunaga 2010). The same traders and processors regularly participate in the commodity stock market (locally and, via their parent companies, internationally). This common practice enables both these companies and agricultural producers to hedge against the price

fluctuations typical in commodity production. In the last few years, however, these agro-food giants, particularly the top four ABCDs, have also speculated in the financial market, inflating global food prices (Murphy, Burch, and Clapp 2012).

In Argentina, the largest exporters also own or operate local milling and processing plants, thereby controlling both the processing and export sectors. The six largest millers, Cargill, Bunge, Vicentín, Molinos Río de la Plata, Dreyfus and AGD, account for 87 percent of total soybean oil exports and almost 90 percent of total soybean meal exports (Regunaga 2010). Argentina has the most efficient vegetable oil processing complex in the world (Turzi 2010) and it is the largest global exporter of soybean oil and soybean meal – accounting for around 55 percent and 48 percent of global total exports, respectively (Regunaga 2010). Since 2007, the soybean-crushing sector has also specialized in biodiesel production for the domestic and export markets (Cohan 2012).

A key player in biodiesel processing and exporting in Argentina – and an exemplary case of distancing – is Renova, which in 2014 broke ground on the largest soybean-processing plant for biodiesel in the world, a USD480 million investment partly financed by a consortium of international banks (Télam 2014). Renova is a joint venture between three companies: Vicentín, Molinos Río de la Plata (one of Argentina's largest food producers) and Oleaginosa Moreno (a formerly family-owned Argentine agribusiness acquired in 1997 by the Swiss-based mining company Glencore) (Infocampo 2011). Glencore is 'one of the world's largest global diversified natural resource companies and a major producer and trader of more than 90 commodities' (Glencore 2015). In Argentina, Glencore controls La Alumbra, an open-pit copper-gold mine in the northern province of Catamarca. In the agricultural sector it controls facilities for oilseed storage, processing and export logistics. In 2014, Glencore's global agribusiness branch grew more than 300 percent to account for 60–70 percent of its USD856 million in annual earnings (Terazono and Hume 2015).

By controlling processing facilities, storage and freight companies, and port facilities, trading companies like Cargill, the world's biggest grain trader, can control the whole soybean pipeline (Turzi 2010; Regunaga 2010). Operating in Argentina since 1947, Cargill is now the country's largest agro-food exporter. In addition to processing and trading in oilseeds (soybean, sunflower and rapeseed), malt and barley, the company engages in flour milling, beef production and financial services. Across the country, Cargill owns five export terminals, four oilseed-crushing plants, two malt plants, two beef-processing plants, seven flour mills, and a network of more than 50 elevators (Cargill 2015).

Transnational seed and agrochemical companies operate in Argentina as well. Frequent mergers, acquisitions, partnerships and joint ventures strengthen these multinational companies' grip on the soybean chain in Argentina and South America (Turzi 2010). Through various such agreements, firms that are ostensibly competitors collaborate to reduce competition and create cartels (ETC Group 2013). Examples of these practices abound. In 2008, Syngenta bought SPS, then the fifth-largest seed company in Argentina (Bertello 2008). Bayer CropScience acquired Argentine seed company FN Semillas in 2013 and, in 2014, bought Biagro Group, an Argentine company specializing in inoculants and biological seed treatments (SeedQuest 2013, 2014). In 2012, US-based GM biotech developer Arcadia Bioscience launched Verdeca, a 50–50 joint venture for soybean seed development with Argentina-based Bioceres, an agricultural investment group specializing in deregulation (ETC Group 2013). Capitalizing on the 2014 expiration of Monsanto's US patent for glyphosate-resistant soybeans, Verdeca is developing new GM seed varieties and obtaining regulatory approval for their use in South America, the United States, China and India (Dow Jones Newswires 2012). In 2013, Verdeca signed a collaboration agreement with GDM Seeds to develop and commercialize

stress-tolerant soybeans (Verdeca 2013). Illustrating the close relationship among agribusinesses, GDM Seeds is part of the Argentine company Asociados Don Mario, the second largest GM soybean seed seller in Argentina and the largest in Brazil (Infocampo 2014a). Don Mario's seed market also extends to Uruguay, Paraguay, Bolivia, South Africa and the United States (Infocampo 2013a). In Argentina, Don Mario commercializes Monsanto's newest GM soybean variety Intacta RR2 Pro (Don Mario 2015). Don Mario also provides its seed genetics to Louis Dreyfus' Argentine seed branch, the third largest marketer of certified GM soybean seeds (Infocampo 2013b). Nidera, the largest seed seller in Argentina, has also adopted Monsanto's Intacta RR2 Pro germplasm to develop and sell its own Super Soy varieties (Nidera Semillas 2015).

The Argentine soybean seed market is not particularly profitable because certified seed sales are low and farmers do not make royalty payments (Delvenne, Vasen, and Vara 2013; Feeney and Berardi 2013). Unlike American farmers, Argentine farmers are not legally constrained to sign contracts and they are entitled under law UPOV 78 to save seeds for future replanting (Pierri and Abramovsky 2009). There is also a large black market in seeds, commercialized in unlabeled 'white bags'. Early on, a permissive intellectual property regime benefited GM companies by facilitating fast adoption of the technological package; now, however, companies are challenging the loss of revenue to the illegal seed market (see Delvenne, Vasen, and Vara 2013). The use of saved seeds combined with illegal seed trading accounts for 65 to 80 percent of the total soybean seed market. Feeney and Berardi (2013) estimate that for 2009–2010 the legal soybean seed market was only 35 percent of the total market. Other estimates are as low as 20 percent in 2014 (Infocampo 2014a). This is one reason firms expand their business across borders: the Brazilian seed market is particularly enticing as the use of certified seeds and royalty payments are close to 70 percent, accounting for sales of more than USD1.2 billion in 2014, compared to a meager USD240 million in Argentina (Infocampo 2014a).

This does not mean that seed companies are not profitable in Argentina. Seed companies benefit from widespread use of the technological package of RR soy, which requires increasing doses of agrochemicals. The major transnational seed companies, such as Monsanto, Nidera and DuPont also produce, import and distribute herbicides, insecticides and other weed-, pest- and disease-control agents in Argentina (Regunaga 2010). According to the Argentine association of agrochemical companies CASAFE (2012), in 2012 the agrochemical market rose to \$2.4 billion, largely due to sales of the RR soy herbicide companion, glyphosate. Compared to the seed/agrochemical sector, the fertilizer sector is more concentrated and it is controlled by the large grain traders and oilseed millers Cargill, Bunge, Nidera, Dreyfus and AGD (Regunaga 2010).

To conclude, in this section I have shown how corporations operate across the different sectors of the soybean chain (seed, fertilizer and agrochemical inputs, processing, storing and trading) in Argentina, and how they have developed deep (but long) links with global and regional supply chains and markets (Friedmann 1994; McMichael 2013). Next, I explore how GM soy production has transformed agriculture and the social structure of rural Argentina. I show how technological innovation is a key to understanding these transformations. First, the adoption of new technologies transforms labor by replacing workers with machines (Schnaiberg 1980). This leads to rural displacement and depopulation in conjunction with the specialization and concentration of rural labor. New rural actors emerge, most notably sowing pools. My aim is to show how the distancing and abstraction processes identified in the agro-food literature (Russi 2013; Clapp 2014, 2015; Isakson 2014) unfold in Argentina.

3. From the ground up: distancing on the farm

The trend of rural depopulation and displacement in Argentina started at the turn of the twentieth century, alongside the history of mechanization of the Pampas region (Barsky and Gelman 2001; Hora 2012). However, this trend has accelerated with the expansion of GM soy monocropping. In 2010, rural residents accounted for 6.9 percent of the Argentine population (2.7 million people), down from 20.2 percent in 1970 (ECLAC 2014). Machines, fossil fuels and chemicals replace labor in large GM soy monocultures (Schnai-berg 1980; Leguizamón 2014a). Only 15 employees are needed to work a 1000-hectare soy farm, compared to 350 for a sugarcane plantation, or 1300 for a citrus orchard of that size (Selén 2014). Throughout the Global South, agro-industrialization has reduced the need for rural labor, displacing rural populations and creating what La Vía Campesina calls ‘an agri-culture without farmers’ (McMichael 2012, 693).

The path of agro-industrial farming has been to minimize arduous physical labor in the field while increasing productivity and maximizing profits (Anderson 2009; for a critique, see Leguizamón 2012). The technological package of RR soybeans reduces labor to a minimum, a major factor in its enthusiastic adoption by farmers. Only a few *pasadas*, ‘passes of a machine through the field’, are needed: one for planting, another (or a few) for agrochemical spraying, and a final one for harvesting. As machines get bigger, they cover more ground in less time, reducing working time. Moreover, farmers describe working atop tractors and combines as a comfortable activity, almost leisurely compared to the backbreaking work of traditional farming – these machines come with hydraulic steering, stereo music systems, built-in refrigerators, air conditioning and computerized and global positioning system (GPS) controls.

Shielding the person who performs the actual task of cultivation from climate conditions in an air-conditioned tractor cabin increases the distance between the farmer and the activity of farming, which used to entail being close to the soil and the natural process of food-growing. This distance is actually even greater than it appears, because the person operating the machine is usually not the farm owner and likely is not even from the area. Agricultural production is performed by *rural contractors*, workers contracted to complete a specific task, such as sowing, fertilizer application, herbicide and pesticide spraying, or harvesting. Rural contractors typically own machinery but no land and thus travel from town to town, from province to province, planting, spraying and harvesting one farm, then moving on to the next (Lódola 2008). Recent studies estimate there are nearly 10,000 contractors, who perform 80 to 85 percent of total spraying and harvesting work in Argentina (Regunaga 2010).

Further separating those who control resources from those who perform the agricultural tasks and from nature are *production contractors*. Production contractors own neither land nor machinery but rent both, hiring other contractors to perform agricultural tasks (Bustamante and Maldonado 2009). Their added value resides in their knowledge of organizing production. Because of the highly technical specificities of using the technological package over extensive areas, agricultural production rests mostly in the hands of ‘experts’. Farming knowledge, traditionally shared and passed down from generation to generation of farmers, is now taught at the university (Grosso and Albaladejo 2009). Those in charge of managing production are no longer ‘farmers’ but agronomists, engineers or masters in business administration. They organize and plan production from afar, using satellite reports, laptops and the Internet to control and monitor crops, soil humidity and inputs needed.

As a consequence, in the Pampas under the GM soy model, the role (and value) of agrarian labor has shifted from physical activity towards managerial tasks of organizing

production, which call for a team of experts with combined knowledge and expertise beyond the productive aspects of agriculture. In interviews, large-scale soy producers agreed that in order to achieve ‘efficiency’ (i.e., to stay profitable), agrarian production requires a team that pools technical, managerial, commercial and financial expertise, and, more important, investment capacities. ‘Sowing pools’ emerged as investment funds to meet this need, particularly to bring in necessary resources after the Argentine crisis of 2001 (Bustamante and Maldonado 2009). An important characteristic of these sowing pools is that they bring urban inhabitants with no knowledge of agriculture into farming purely as financial investors. As stockholders, their goal is to maximize returns on their investment. Therefore, decisions about which crops to grow and which technologies to employ rely mostly on their potential to increase profits (Gould 2009; Isakson 2014). This exemplifies how financialization of the food system has distanced the controllers of agriculture from agriculture itself (Clapp 2014, 2015).

Next, I focus on the activities of large-scale sowing pool agribusinesses. These firms are both the cause and a manifestation of the ongoing agrarian transformation in Argentina, as they devise a new ‘paradigm’ of agricultural production (Hernández 2009; Gras and Hernández 2009b, 2013, 2014).

4. Disappearing nature: large agribusinesses and finance

Technological innovation has removed farmers from the physical labor of agriculture. New contracting and subcontracting arrangements further distance the farmer from the farm. This distance is compounded as new actors – mainly transnational agro-food corporations and financiers – enter the food system and take control of the farm (Clapp 2014, 2015). In this section I analyze how these actors operate in Argentina and how local agricultural practices have been transformed to fit the demands of the global food system.

Agricultural production in Argentina reflects global trends of increasing concentration, increasing integration and increased scale. The activities of large *agronegocios*, agribusinesses popularly known as *pools de siembra*, ‘sowing pools’, exemplify how Argentine agriculture has been reorganized to serve the global food system (Murmis and Murmis 2012; Gras and Hernández 2014). ‘Sowing pool’ refers to the pooling of land, capital and human resources for agricultural production. This novel mechanism for agricultural production is ‘characterized by the fundamental role played by investment funds and by a business model whereby control of agricultural production is acquired by leasing large extensions of land ... and by contracting teams for sowing, fumigating, harvesting, and transporting’ (Gómez 2014, 11). Specifically, sowing pools are involved in ‘leasing or providing property in trust, contracting machines and services, using technological packages based on modern machinery, heavily utilizing biotechnology or agrochemicals and incorporating digital systems and individuals who specialize in field selection, production, management, and marketing’ (Murmis and Murmis 2012, 491).

While not all sowing pools engage in large-scale production, size does matter (Murmis and Murmis 2012; Gras and Hernández 2014; Cáceres 2015). Soy production in Argentina is highly concentrated by large agribusinesses that farm vast tracts of land (Gras and Hernández 2014). In 2010, only 2.6 percent of producers (approximately 1600 farmers) controlled more than 50 percent of soybean production, farming 9.34 million hectares in plots larger than 5000 hectares (Catacora-Vargas et al. 2012). According to the United Nations Food and Agriculture Organization (FAO), the five largest agribusinesses operating in Argentina – MSU, Los Grobo, El Tejar, Cresud and Adecoagro – control, via landowner-ship or leasing, close to three million hectares of farmland in Argentina and neighboring

Uruguay, Bolivia, Paraguay and Brazil (Gómez 2014).² El Tejar controls 1.1 million hectares (Gómez 2014), and Cresud almost a million hectares in a mix of farming and farmland development in Argentina, Brazil, Paraguay and Bolivia (Cresud 2015), making these companies, respectively, the fourth and fifth biggest landowners in the world (Kazakhstan Newswire 2014). Adecoagro, controlled by the fund of US billionaire George Soros, owns 293,423 hectares (*New York Times* 2015), while Los Grobo harvested 320,000 hectares in 2011, its peak year (*Economist* 2014). The technological package of GM biotech along with developments in information technology³ facilitate expansion and corporate concentration because they enable the farming of huge areas of land, and these giant firms can negotiate more favorable terms than smaller competitors can (Murmis and Murmis 2012; Gras and Hernández 2014).

The activities of these giant agribusinesses extend beyond farming through processes of vertical and horizontal integration to input supply, grain trading, food processing, transportation and investment in the stock market. Adecoagro, for example, engages in farmland development, crop production (oilseeds, cereals, sugar, coffee and cotton), cattle and dairy farming, and sugarcane processing for ethanol production (Adecoagro 2015). In addition to crop production and farmland development, Cresud participates in the livestock industry through a joint venture with Tyson (the world's largest meat processor) and US Cactus Feeders to create the 'first vertically integrated cattle project' in Argentina (SEC 2007). Via subsidiary IRSA, Cresud also engages in urban real estate development of shopping malls and luxury hotels (Cresud 2015). Los Grobo developed an innovative verticalization strategy called *modelo asociativo en red*, 'associative network company' (Los Grobo 2015). The model is based around building a network of input and service providers, including landowners, agronomists, contractors and branch managers, so that instead of directly hiring employees or owning land or machinery, the company operates through land leases and third-party contracting (Bell and Cintra 2010).

Los Grobo's associative network model represents a shift away from the materiality of farming (i.e., direct ownership and control of resources) and toward leasing, contracting and specialization in the managerial/organizational aspects of production. Particularly since 2012, years which witnessed slimmer profit margins for soy and rising tensions with the government, Los Grobo has further transformed its business by slashing direct agricultural production (hectares under lease for production are at an all-time low) and focusing instead on services, input provision, seed development (via companies Bioceres and Verdeca) and agrochemicals (via its 2013 acquisition of Agrofinia) (Bertello 2013). Its stated goal is to expand vertical integration to provide a 'one-stop shop' for farmers (*Economist* 2014).

Acquisitions grow businesses but they are not cheap. Recent strategies for financing agribusiness expansion have involved partnerships and participation in the stock market. To raise capital to purchase Agrofinia, Los Grobo sold shares on the Buenos Aires Stock Exchange (Infocampo 2014b). It also sold its Brazilian unit, Los Grobo Ceagro, to Japan's biggest trading company, Mitsubishi (Rosendo González 2014). Increasingly,

²Sowing pools are not counted as a category in the rural census; therefore, there is no official data about them. Data is estimated based on press and Internet sources (in some cases, the companies' own websites). These figures are compatible with those reported in similar peer-reviewed articles, such as Cáceres (2015); Gras and Hernández (2014); and Murmis and Murmis (2012).

³Information technology (IT) developments that have greatly facilitated geographical expansion include communication technologies (phone, fax and the Internet), GPS, and software applications for risk analysis and resource and production planning. For examples of how Los Grobo applies these technologies, see Bell and Cintra (2010).

Argentine agribusinesses sell shares locally on the Buenos Aires and Rosario stock exchanges, and internationally on the São Paulo and New York exchanges. In a matter of years, historically family-owned businesses like Los Grobo, MSU and El Tejar have rapidly transformed into very complicated corporate structures that include international commercial banks, mutual funds, hedge funds and private equity investors. For example, El Tejar, founded in 1987 by an association of Argentine farming families, is now 40 percent controlled by the New York- and London-based hedge fund Altima Partners, while the US private equity firm Capital Group owns another 15 percent stake. Capital injections from these financial sponsors have helped El Tejar expand its business by purchasing farmland in Brazil (Terazono and Webber 2013). At USD800 million, Altima is one of the largest investment funds in global agriculture, with holdings in companies operating in Australia, Eastern and Central Europe, South America and sub-Saharan Africa (Luyt 2013).

Cresud and Adecoagro offer other revealing examples of how financial capital gets injected into agricultural production. Cresud was a 63-year-old public company when Eduardo Elsztein acquired it in 1994, partly with funds from George Soros (Goldberg et al. 2013). Cresud was already traded on the Buenos Aires stock market and, after Elsztein's acquisition, a new rights offering raised USD64 million for land purchases. In 1997, Cresud undertook a global public offering for 43 percent of its shares on the NASDAQ Stock Exchange (Goldberg et al. 2013). Since then, share sales on NASDAQ have been frequent sources of financing for Cresud's expansion. The company also relies on partnerships and joint ventures to raise revenue. For example, in June 2011, Cresud signed a joint venture agreement to purchase land and cultivate soybeans for Heilongjiang Beidahuang Nongken Group, China's largest farming company (Grain 2012). Similarly, in 2006, Cresud founded BrasilAgro in partnership with a Brazilian real estate company and the investment fund Tarpon (Goldberg et al. 2013). Currently, Cresud holds 39.6 percent of BrasilAgro's shares; JP Morgan Whitefriars (a subsidiary of JP Morgan Chase) holds 10.5 percent; Brazilian billionaire Elie Horn, 5.6 percent; and Brazil's Banco Fator, 5.3 percent (*Valor Econômico* 2013). In Paraguay, Cresud owned half of Cresca, a 50–50 joint venture with Argentine agribusiness Carlos Casado, but sold its shares in December 2013 to its partnership BrasilAgro, allegedly to bypass foreign currency restrictions in Argentina (El Cronista 2013).

Adecoagro was founded in Argentina in 2002 by a group of Argentine and Brazilian entrepreneurs sponsored by global institutional investors (Adecoagro 2015). Since 2010, the company has operated as a *société anonyme*, the equivalent of a US corporation under Luxembourg law. In 2011, Adecoagro went public on the New York Stock Exchange, in an offering of more than USD400 million (DealBook 2011). Among Adecoagro's largest shareholders are Soros Fund Management; Al Gharrafa Investment Company, a unit of Qatar Holding; Ospraie Management, a US-based hedge fund also deeply invested in mining projects; mutual funds managed by US investment advisory firms such as Jennison Associates and Brandes Investment Partners; and PGGM Vermogensbeheer BV, a Dutch pension fund manager (CNN Money 2015).

The preceding examples show the pervasiveness of financial capital in agriculture, as well as the growing interest of the financial sector in farmland (McMichael 2012; Fairbairn 2014). Another emerging trend is the involvement of sovereign wealth funds (Luyt 2013), as investments by Qatar Holdings in Adecoagro, and by China's Beidahuang in Cresud, illustrate.

The Argentine 'agribusiness model' represents a paradigm shift in agricultural production (Hernández 2009; Gras and Hernández 2009a, 2013, 2014). Los Grobo has been

instrumental in devising and implementing this ‘new agricultural paradigm’, summarized below by the Wave project, funded by BNP Paribas:

Los Grobo, one of the largest agro-food producers in Argentina, operates according to an elegantly simple principle: no land, no machines, not even a tractor. Everything is rented. ... According to Los Grobo CEO Gustavo Grobocopatel, ‘This model is based on knowledge rather than ownership, and it will change the agricultural paradigm’. By adopting open innovation, creating a pool of more than 120 experts with a very wide range of skills, and operating as a network, these ‘landless’ South Americans are the new wave of innovators. (Wave 2015)

Los Grobo’s novel approach to agriculture is disseminated across the country via groups like the Argentine No-Till Farmers Association (AAPRESID), and agricultural fairs like Expoagro. It is a ‘paradigm’ in the sense that it is a comprehensive worldview consisting of social, structural, technological, cultural and symbolic dimensions (Hernández 2009; Gras and Hernández 2009a, 2013). From the perspective of agribusiness, the value of agriculture lies not in the natural conditions that make it possible but in the expert know-how to manage and organize production, and in the scientific knowledge to develop new agrarian technologies (e.g., no-tillage machinery and GM biotechnology). Agribusiness elevates knowledge as a means of production more valuable than land itself. Whereas the demands of neoliberal globalization push for efficiency and flexibility, land, being fixed, means immobility. Therefore, in the new agribusiness paradigm, land becomes a drag, a hindrance to the mobility of capital (Hernández 2009).

Large producers in Argentina thus aim to accomplish a fabulous feat: making land disappear from the farming equation. How is it possible to ‘overcome’ land as a fixed factor of agricultural production? How do what the Wave project calls the ‘landless’ become the largest of agrarian producers?⁴ Large sowing pools accomplish this, first, by leasing land (and machinery and labor) instead of owning it. Land leases, generally on one- to three-year contracts, afford flexibility: once the contract ends, producers are free to move elsewhere. Small landowners benefit as well, because it is more profitable to rent their land than to farm it themselves – and risk losing it altogether when they are unable to compete with large pools. Leasing land also allows pools to become bigger, expanding production over greater areas (Gras and Hernández 2014). This comes to show that land ownership has become less relevant, though control over land is still crucial. Large-scale farming then becomes in some cases akin to land grabbing (Murmis and Murmis 2012; Cáceres 2015).

Second, in another strategy to achieve flexibility, large agribusinesses extend production into other countries. Farming in different climates, environmental and political, accomplishes another main objective of soy producers, to reduce variability and uncertainty. Whether the challenge is variable weather and rainfall cycles or government-imposed export quotas and taxation, expanding production across several countries diversifies risk and stabilizes production output. Planting soybeans also facilitates these objectives as soybeans are ‘flex crops’ with multiple and flexible uses, as food, fuel, animal feed and building material (Borras et al. 2012). A regionally integrated South American soybean chain, where soybeans can be interchangeably produced in Paraguay or Brazil then processed in and shipped from Argentina (Turzi 2010), closes the cycle. Flexibility,

⁴Gustavo Grobocopatel, CEO of Los Grobo, was the first to call himself a ‘landless’. Grobocopatel’s statement was a deliberate verbal provocation of peasant activists by misappropriating the *sem terra* name from the Brazilian Landless Rural Workers’ Movement (MST).

efficiency and predictability, required characteristics of just-in-time global capitalism, are thereby achieved. Farming, once constrained within the limits of the natural environment, now expands over a 'virtual territory' (Hernández 2009, 53–54).

The agribusiness approach towards agriculture and nature described in this section respond to, and are part of, the growing financialization of land and food crops around the world (Fairbairn 2014; Isakson 2014; Clapp 2014). The financialization of farmland is the latest frontier in the financialization wave, a process that accelerated after the rise of food prices in 2007 (Lawrence 2014). As Fairbairn (2014) notes, the farmland investment boom is not merely speculative (i.e., speculating on financial returns from land appreciation). Investors' interest also relies upon farmland's productive capacity; that is, engaging in agricultural production for potential return in commodities. Those consortiums solely interested in land's productive capacity, like Los Grobo, engage in a strategy Fairbairn (2014) identifies as 'lease-operate', which is preferred over landownership. Compared to 'own-lease out' and 'own-operate' investment strategies, 'lease-operate' gives the highest risk-return. Under a 'lease-operate' strategy, agribusinesses speculate not on the value of land but on the value of crops, which explains the preference for flex crops (Isakson 2014).

However profitable 'lease-operate' agricultural production may be, there are important implications to short-term contracts. As Fairbairn (2014, 16) notes, 'aside from the obvious impact this has on the structure of agriculture, it also reduces the farmer's incentive to use sustainable practices by removing his or her stake in future productivity'. Here is a key consequence of 'distancing': the ability of decision-makers to remove themselves from the social and ecological consequences of their decisions (Princen 1997, 2002; Gould 2006). Los Grobo's self-proclaimed emphasis on 'knowledge-based' agriculture, on innovation and on 'elegantly simple' principles (Wave 2015) is a 'shading' strategy (Princen 1997, 2002) that obscures the violence of dispossession perpetrated against the rural and indigenous poor (Lapegna 2013, forthcoming; Cáceres 2015). Shading allows decision-makers to present themselves as providers of solutions, not creators of environmental and human ills; thus, it becomes harder for activists at the end of the soy chain to pinpoint who is responsible for the negative consequences of agro-industrial production (Gould 2006; Clapp 2014).

5. Conclusion

Multinational agribusinesses present GM crops as a solution to alleviate world hunger and poverty in the context of the challenges of climate change. Versatile 'flex crops' fit this discourse well, because they could be alternatively directed to address any aspect of the food, fuel, fiber and climate crisis (Borras et al. 2012; McMichael 2012; Isakson 2014). Flexible GM crops like soy are thus touted as representing the promise to disconnect agricultural production from its natural conditions: allowing production to increase despite drought, land scarcity, excessive heat and other extreme climatic conditions. Argentine soy producers are major promoters of this belief; they claim knowledge – not land, climate or labor – is the most essential component of agricultural production. They are optimistic that scientific and technological innovation will offer solutions to the current socio-ecological crisis – and that Argentina, via GM biotech adoption, will be a key player in feeding the world.

In this contribution, I have explored how, by promoting a 'knowledge-based' agricultural paradigm for the production of profitable flex crops, agribusiness aims to disconnect and abstract agriculture from its natural origins as a food-producing, body-sustaining

activity (Araghi 2009). By highlighting the many drivers of distancing across the soy value chain in Argentina, I have shown how large-scale agribusinesses engaged in soybean production, in articulation with global financial investors, are instrumental to the process of distancing and abstraction identified in the agro-food literature.

The distancing and abstraction of food and farm resulting from a ‘knowledge-based’ agribusiness model in particular, and from the financialization of the corporate food system under neoliberal globalization in general, has significant socio-ecological costs, however. Despite its ‘virtual’ appeal, the GM soy model has entailed – contrary to the rhetoric of agribusiness – an intensification of fossil fuel- and chemical powered-agro-industrial practices. Labor-replacing technologies within the logic of increasing accumulation in actuality decrease social benefits and increase ecological risk (Schnaiberg 1980; Schnaiberg and Gould 1994; Gould, Pellow, and Schnaiberg 2008). In Argentina, critics point out the ‘dark side’ of the expanding GM soy model (Lapegna 2013), claiming it is an unsustainable practice (Teubal 2008; Giarracca and Teubal 2010; Leguizamón 2014a; Cáceres 2015).

The agribusiness emphasis on knowledge is attractive: potentially, knowledge does not decrease from being shared, unlike scarce resources necessary for agricultural production, such as land and water. The agro-industry would have us believe that future developments in GM biotechnology promise to increase yield per hectare and enable cultivation on drought-prone and marginally fertile land. Yet technology cannot escape the fact there is no agriculture without land, and there is only so much land on this planet. The current wave of financial capital infusion in farmland is a response to the fact that land is a fixed asset with limited availability (Fairbairn 2014). The rush for land and water, and the enclosure of the commons in general, is nothing more than capital’s survival strategy of accumulation by dispossession and displacement disguised by the abstractions of knowledge (Harvey 2003; Araghi 2009; McMichael 2012). Distancing and agribusiness promotion of an agricultural model based on knowledge and innovation render invisible the truth that the GM soy model feeds upon the violence of dispossession, by robbing indigenous and peasant families of their territories, endangering the health of populations exposed to agrochemical drift, and undermining the sustainability of the environment (Pengue 2005; Cáceres 2015; Lapegna forthcoming). Effectively linking decision-makers to the consequences of their decisions – that is, making elites responsible for the consequences of their actions, becomes more challenging as distance increases, but is crucial to socio-ecological sustainability (Gould 2006; Clapp 2014, 2015).

Acknowledgements

This contribution is based on work supported by two Doctoral Research Grants and a Dissertation Fellowship granted by The Graduate Center of the City University of New York (CUNY). I’m deeply grateful to Ken Gould, Justin Myers, Monica Guerra, Sam Cohn, Gustavo Oliveira, Susanna Hecht, JPS editor Jun Borrás and two anonymous reviewers for their tremendous insight, comments, suggestions and support. Many thanks also to Kirsteen Anderson for her copy-editing help.

Disclosure statement

No potential conflict of interest was reported by the author.

Funding

The Graduate Center, City University of New York (CUNY).

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