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# **Soybean Agribusiness in Argentina (1990–2015): Socio-Economic, Territorial, Environmental, and Political Implications**

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Additional information is available at the end of the chapter

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## **Abstract**

Nowadays, soybean value chain is both the major expression of agribusiness and one of the most troublesome uses of territory of Argentina. This chapter is aimed to analyzing the worrying socio-economic, territorial, environmental, and political implications unchained by the expansion of the soybean's pattern during the last 25 years. On the basis of scholarly literature and both official and unofficial sources of data, we have studied the restructuration of the rural sector, the concentration of both the rural property and the agro-industrial chain, the new territorial enclosures, the socio-ecological and health consequences of the soybean's advance, and the influence of the transnational seed industry on the farmers' subordination. Our results show a substantial reduction of both the amount of rural units and the traditional production areas, the emergence of new leasing practices, the accumulation chain's vertical integration, the growth of the land's concentration, the expulsion of aborigines and peasants, the increase of deforestation and environmental degradation, the loss of legal and food sovereignty, and the serious impacts on the population's health due to the massive fumigations with agrochemicals. The chapter's findings suggest that soybean agribusiness should be considered as an irrational use of territory for most of the national society.

**Keywords:** agribusiness, GM soybean, rural restructuration, land's concentration, vertical integration, territorial enclosures, environmental and health issues, seed and agrochemical companies, Argentina

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## **1. Introduction**

Geographic space just can be explained by analyzing the division of labor's dynamics and the different uses of territory [1], i.e., the configuration of material and immaterial flows that

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show the spatial and temporal regularities of a given cycle of capital's rotation and reproduction [2]. Regarding the agricultural uses of territory belonging to the so-called agribusiness [3], such as "spatial circuits of production" [4] are typically organized through agro-industrial value chains, which include several stages (e.g., agricultural inputs' supply, rural activities, industrialization and distribution of goods, transport, financial, and commercial networks, etc.). Various conflicts and mechanisms of domination are unleashed on the surplus' appropriation owing to the input-output links and the unequal social relations of power developed among the agents of each chain's stage.

Since each of the agribusiness clusters has got one (or more than one) accumulation cores, the most dynamic capitalist agents deploy several strategies to articulate the productive chain according to their own interest. As a result, they appropriate most of the profits produced by other agents and the resources injected into the circuit by the State [5, 6]. Such situation implies that agribusiness may be considered as the rural expression of the "neo-extractivism" [7], i.e., updating the natural resource exploitation and profits external appropriation's pattern introduced in Latin America during the colonial age and renewed during the following periods [8].

Although in the past, soybean stayed as an exotic species and a botanical rarity in Argentina, currently it concentrates 59% of national grain area and 93.2% of Argentinean grain production. Soybean areas have grown exponentially during the 4 last decades, climbing from 30,470 hectares in the agricultural year 1970/1971 to 206,025,042 hectares in 2015/2016. Similarly, soybean production have increased 451% between 1989/1990 (10,671,100 tons) and 2015/2016 (58,800,498 tons) [7, 9]. As a result, Argentina became the third soybean world producer and exporter, as well as the first soy oils and flours exporter [10, 11].

Several factors deserve to be mentioned in order to explain that change, such as the suitability of this crop to be combined with the production of hybrid varieties of wheat, the growth of the European market of balanced feed for pig and poultry [12], the structural reforms introduced by neoliberalism during the 1990s, the world crisis of stockbreeding, the sustained growth of external demand for vegetable proteins due to the European Economic Community's authorization on the imports and processing (but not planting) of GM soybeans, and the consequent rise of the soybean's international price. Lately, the agro fuels boom and the financial crisis unchained in 2008, which encouraged investment funds to migrate from the real state markets to the commodities markets, have undoubtedly helped to consolidate the soybean pattern in Argentina.

Although big farmers, agro-industrial enterprises, seed companies, and even the National State often invoke the alleged benefits of this pattern, during the last 15 years, a leafy scholarly literature has revealed the dark side of the soybean boom. Several researchers have presented general studies on the negative impacts of the soybean pattern [7, 13–19], whereas other authors exhaustively analyze individual features of this matter. For instance, Teubal emphasizes the vulnerable and dependant condition of soy monoculture and its export orientation [20], whereas Teubal and Rodríguez claim that soybean pattern is the major driver of the concentration and transnationalization of the Argentinean agro-industrial accumulation chain [21]. Hernández focuses on the cultural and empresarial fragmentation of the rural sector [22], while Domínguez

and Sabatino state that soybean's boom has led to both the scarcity and the price increase of the national diet's traditional foods [23].

Other researchers have expressed concern about the risks of the transgenic soy agriculture at great scale, noting the loss of legal and food sovereignty stemming from the seeds' privatization [24–27]. Furthermore, several papers have studied the environmental implications of soybean fever, specially soil erosion, virtual water exports, and deforestation [28–32]. In addition, Rodríguez Striebeck analyzes the soybean boom's influence on the land struggles [33]. Finally, other works have focused on the relationship between soybean fever, fumigations with agrochemicals and the substantial growth of oncological diseases and births with malformations reported during the last years in the rural towns [34–38].

As a result, GM soybean is not only the major expression of agribusiness in Argentina but one of the most controversial and troublesome uses of territory in this country. Because of such situation, the main purpose of this chapter is analyzing the worrying socio-economic, territorial, environmental, and political implications unchained by the expansion of the soybean's pattern during the last 25 years.

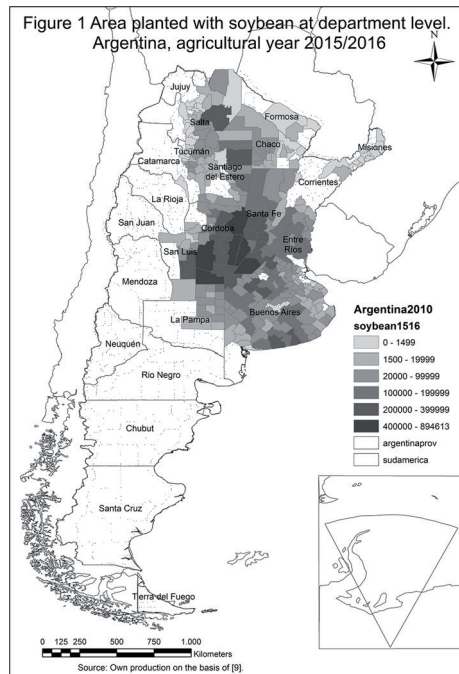
Firstly, the soybean agribusiness' socio-economic issues, i.e., the technique and productive restructuring of the rural sector, the new leasing practices, and the agro-industrial chain's vertical integration are studied by analyzing the variation of the area sown with other crops and occupied by livestock, the reduction of rural units, the surface leased to sowing pools and investment funds, the origin of such capitals, and the participation of the main soybean firms in different links of accumulation chain. Secondly, the territorial perspective, i.e., the new enclosures associated to both the land's concentration and the expulsion of peasants and aborigines, is considered by describing the land grabbed by the landowners, the land struggles in soybean provinces, and the dispossession mechanisms carried out by farmers, sowing pools, investment funds, and agro-industries. Thirdly, the environmental and health consequences of this pattern are discussed by considering the area of native forests logged due to the soybean frontier's expansion, other ecological degradation's phenomenon (e.g., virtual water exports, soil erosion, greenhouse gas emissions, etc.), the volume and kind of agrochemicals used in soybean cultivation, and the reports on health problems associated to such fumigations. Finally, the influence of the transnational seed industry on the farmers' subordination and the loss of both legal and food sovereignty is demonstrated by identifying the major companies of the sector, characterizing their accumulation strategies, and describing the main conflicts regarding the acquisition and use of transgenic soybean' seeds.

## **2. Socio-economic issues of the soybean boom: from the agricultural restructuring and the rural units decreasing to the new leasing practices and the vertical integration by property**

Soybean agribusiness is essentially an exports-oriented accumulation chain. More than 90% of production is exported to countries including China, India, the European Union, Pakistan,

Bangladesh, and Japan [10, 11]. Since soybean value chain concentrates 40% of agricultural exports [12] and is the major exporter sector (27.7%) of the Argentinean economy [39], such productive circuit generates bulky profits (20,000 million of dollars per year). A substantial part (30%) of these profits is appropriated by the National State by collecting taxes on exports. Nevertheless, the soybean value chain's contribution to labor market is very small. Actually, the labor force employed in the soybean cluster reaches 193,894 workers, i.e., 10.3% of agro-industrial employment and 3.1% of whole employment. Such figures imply a labor intensity (seven jobs per million of dollars of value), three times smaller than the national average [40, 41]. In addition, soybean boom has led to a dramatic restructuring of the rural sector in our country.

As shown by **Figure 1**, agricultural stage of the soybean circuit has acquired a noticeable geographic dispersion, not only strengthening in the Pampas, i.e., Buenos Aires, Córdoba, Santa Fe, Entre Ríos, and La Pampa, but spreading much of other Argentinean provinces (e.g., San Luis, Jujuy, Salta, Catamarca, Santiago del Estero, Tucumán, Chaco, Formosa, Corrientes, and Misiones). In fact, all these provinces increased its area planted with soybean among 33.3 and 7.920% during the period 1990–2015, except for Misiones [9]. According to the last Agricultural National Census performed in 2008, soybean has absorbed among the third and more than half of the agricultural area of the provinces of Buenos Aires, Santiago del Estero, Chaco, Tucumán, Córdoba, Entre Ríos, and Santa Fe [42]. Significantly, soybean means 66% of the



**Figure 1.** Area planted with soybean at department level. Argentina, agricultural year 2015/2016.

land conquered by the agricultural frontier's advance in Chaco, Tucumán, Salta, and Santiago del Estero [11]. Although both the Pampas' periphery (e.g., Entre Ríos, and La Pampa) and the provinces located outside this region (e.g., Chaco, Santiago del Estero, etc.) have increased substantially its relative weight on the planted area, the Pampas' core still concentrates 85% of soybean's production units [9, 11]. Likewise, the chain's agricultural stage shows high levels of business concentration. In fact, 6% of agricultural units mean 54% of soybean grain's production [43].

According to Silveira, nowadays modern uses of territory seek to erase the traces of the past in order to the space be rewritten by the new rationalities of the present [44]. The aforementioned soybean expansion is, by way, a clear example of this logic, though it has led to the disappearance of both the ancient practices of rotation among stockbreeding and agriculture, and the traditional regimes of alternation between diverse crops. For instance, more than 10 millions of heads of cattle were suppressed during the 1990s, while the livestock decreased 6% between 1988 and 2002 and the amount of milking yards was halved [23]. In the Pampas, i.e., a strongly milk's production-specialized region, some milk companies closed most of their production units to plant soybean. Furthermore, scarcity of lands for stockbreeding has implied decreasing of the livestock area, as well as the cows' concentration in the so-called feed lots.

Other traditional productions were sacrificed in order to free lands to the soybean frontier's advance. For example, the oats area decreased by 37% between 1989/1990 and 2015/2016, as well as sunflower and barley area reduced by 48.7 and 50.5%, respectively. Moreover, the falls suffered by the canary grass (66.8%), the millet (87.7%), and the flax areas (97.1%) were even more substantial [9]. Generally speaking, although other crops have increased its area (e.g., sorghum, corn, wheat, bread wheat, horticultural products, peanut, etc.), such global variations hide a dramatic reduction during the early years of soybean boom. Outside the Pampas, the previous structural crisis of some crops was functional to the monoculture's advance too. For instance, Tucumán lost the quarter of sugar cane area between 1990 and 2001, whereas the Chaco's cotton area reduced by 52.3% during the period 1990–2015 [9].

Owing to the growing weight of science and technology in rural activities, the new soybean production's requirements have involved the introduction of specialized technical systems (e.g., direct sowing, modern rural machinery, global-action herbicides, fertilizing with nitrogenous, prilled urea and phosphorus, etc.). Both the modernization of agricultural practices and the incorporation of the last technology led to the massive indebtedness of the rural producers. Due to the high interest rates, the original debts' values increased 12 times in few years. As a result, in the beginning of the 2000s, the rural sector owed 7000 million dollars to banks, as well as 3000 million dollars to inputs suppliers. Such situation implied the bargain sale of 10 million hectares and the mortgage of 14 million hectares [7, 12]. Since they were unable to resist the productive and financial costs of the new soybean's pattern, several small and medium-size producers disappeared, the same ones who could renew their equipment and living with dignity before the soybean boom [45].

According to the Agricultural National Census, almost third (32.9%) of the Argentinean rural production units disappeared during the period 1988–2008 [42, 46]. A strong, noticeable empirical correlation between such farms reduction and the soybean specialization may be

identified. Significantly, none of the 10 major soybean provinces lost less than the quarter of rural production units during the analyzed period, except for La Pampa and Salta. In addition, these ten provinces represent 68.8% of the missing farms of the country (95,418 over a total of 138,639). Such reduction was equal to or higher than the national average in almost half of the cases, as demonstrated by Entre Ríos (-32.8%), Córdoba (-33.7%), San Luis (-38.6%), Tucumán (-53.7%), and Buenos Aires (-54.1%). Finally, the four major soybean provinces, i.e., Buenos Aires, Córdoba, Santa Fe, and Entre Ríos, have meant 53.1% of missing units of rural production.

Most of those small- and medium-size farmers who kept their lands finally leased it to extra-agricultural origin companies, such as sowing pools and investment funds. These companies include a great variety of firms, such as agronomies, big storing enterprises, input suppliers, banks, insurance companies, managers of retirement and pension funds, isolated investors, rural machinery contractors, agro-industrial companies, agricultural producers, writing desks, and both national and foreign holdings [23]. Although the sowing pools' origin is very diverse, such leasing practices are basically carried out by the financial capital, which resorts to various mechanisms (e.g., trusts, foreign funds capitalizations, stock-exchange organizational forms, local alliances, informal agreements, etc.) to appropriate the rural lands in order to control the accumulation of the chain's primary stage and entering and exiting the commodities market quickly [23, 47]. Currently, 70% of agricultural area of the country has been leased to sowing pools and investment funds [17].

Although all these capitals resort to different mechanisms (e.g., leasing-network firms, patrimonial ownership, purchase of lands by using external capitalization funds, etc.), they develop a common strategy: diversifying agro-weather, economic, political, and legal risks in order to combine high levels of liquidity, rapid returns on initial investment, and big financial and agricultural rents. Thus, such mega-companies obtain lower prices on the inputs supply, impose conditions to the farmers, and influence the prices of the land [47].

As a result, a lot of small- and medium-size farmers have been relegated from the productive circuit, keeping the nominal property of their fields but losing all control over the agricultural practices developed there. Provided the economic rationality of sowing pools is obtaining the highest profit in the short terms, farmers' lands often are super-exploited. Once farmers had regained effective possession of their lands, they face several difficulties in order to re-enter the productive circuit due to the loss of fertility, the destruction of soils, and the high economic costs of its reparation. Consequently, farmers use to sell their lands, thus increasing the concentration of rural property in few hands.

Typical agro-industrial backward integration strategies are developed too. Agro-industrial stage of soybean circuit includes the production of flours and oils, as well as the storage and shipment of these products. As the agricultural link, the agro-industrial stage is highly concentrated, both in economic and territorial terms. In fact, 80% of crushing plants are mainly located in the south of Santa Fe, i.e., the biggest port and agro-industrial cluster in the world. As the great crushing capacity of the Argentinean soybean cluster is very similar to the USA and Brazil ones, oil industries feed not only from the national production but the grains imports from Paraguay. Soybean agro-industry has an oligopsony structure, which includes the major



grain traders from USA, France, Switzerland, Netherlands, and China (e.g., Cargill, Louis Dreyfus, Glencore, Bunge, Noble, Nidera, and Cofco). However, some big national firms have a significant participation in soybean agribusiness too, such as Oleaginosa Moreno, Aceitera General Deheza, Molinos Cañuelas, Vicentín, and Molinos Río de la Plata. Remarkably, only thirteen companies produced 89% of both soybean flours and oils in 2015, while just eight firms meant 76.1% of oils and 82.4% of flours [48].

Moreover, the corporations aforementioned control two other strategic links of soybean circuit: the biodiesel production and the exports. Owing to both the world agro fuels boom and the growth in European and US markets, the Argentinean biodiesel production increased 435.7% between 2007 and 2010, rising from 560,000 to 3,000,000 tons. The domestic biodiesel market is mainly controlled by Louis Dreyfus, Eurnekián, Bunge, Aceitera General Deheza, Vicentín, Glencore, and Molinos Río de la Plata [49]. Regarding the chain's final stage, soybean agribusiness currently represents both 70% of the Santa Fe's foreign trade and between the third and the half of Córdoba's exports. Furthermore, soybean means around the tenth, the fifth and the quarter of the exports of Buenos Aires, Entre Ríos, and La Pampa, respectively. Finally, this value chain represents 25% of the foreign trade of Santiago del Estero and Chaco [50].

In addition, it is worthwhile noting that some oil industries and grain traders (e.g., Louis Dreyfus, Bunge, Nidera, Aceitera General Deheza, and Molinos Río de la Plata) have purchase and/or leased large tracts of rural lands for soybean sowing in order to ensure a stable supply of material raw [51]. Furthermore, these agro-industries have created their own storing territorial networks and so have reinforced their control over the circuit's primary stage. The aforementioned firms and others companies (e.g., Vicentín, Cofco, Toepfer, Cargill, ADM, etc.) have carried out forward integration too, specifically toward the logistic and transportation stages. This has been done by using three mechanisms: the purchase of big fleets of trucks, the control of the share capital of some railroads (e.g., The New Central Argentinean Railroad, which belongs to Aceitera General Deheza), and the appropriation of most of the port infrastructure of the provinces of Santa Fe, Buenos Aires, Entre Ríos, and Chaco.

### **3. Territorial perspective: soybean fever, rural property's concentration, and the new enclosures**

Soybean area's growth and the land's concentration are two phenomenon closely related. In fact, 936 landowners hoarded 35,515,000 hectares in the beginning of the 2000s, whereas 137,021 farmers only gathered 2,288,000 hectares [14]. Moreover, just nine holdings control 32% of rural lands of the province of Buenos Aires. This is because of two factors. On one hand, traditional rural families have joined foreign capitals by complex mechanisms (e.g., trusts, anonymous partnerships, dummies, farms subdivisions, fake sales, etc.) in order to shirk the provincial Treasury [52]. On the other hand, some mega-companies have emerged too, as shown by the cases of both national (e.g., Los Grobo, El Tejar, MSU, etc.) and foreign firms—for instance, Cresud and Adecoagro, belonging to the Hungarian-American tycoon George Soros. According to various estimations, such mega-companies control an area of 1,500,000 hectares [7, 12].

It is worthwhile noting that both land's concentration and new leasing practices have strongly relied on the soybean's expansion outside the Pampas' core. Operating as the driver of a substantial worsening of rural violence, such phenomenon is clearly associated to the so-called new enclosures, i.e., the silent but relentless cornering process suffered by peasants and aborigines during the last 2 decades [53]. Since the soybean fever encouraged big farmers, landowners, sowing pools, investment funds, and oil industries to expand toward the Pampas' edge and the Argentinean North, new territorial enclosures have risen in such regions. Current legislation both recognizes Aboriginal land rights and ensures the land ownership to those peasants who can prove they have occupied and exploited it during at least 20 years. Nevertheless, the legal precariousness of the land property in various provinces often implies that subaltern groups to be easily overwhelmed by the hegemonic agents of soybean agribusiness.

According to official data, 857 conflicts on the control of the land were reported in Argentina in 2011, involving 63,843 rural families and an area of 9,293,234 hectares. It is worthwhile noting that 48.5% of these situations were denounced in soybean provinces (e.g., Buenos Aires, Chaco, Córdoba, Entre Ríos, Formosa, La Pampa, Salta, San Luis, Santiago del Estero, and Tucumán) [54]. In addition, unofficial sources claim that land struggles have been increased in the Argentinean North and the Pampas' edge during the last years. In fact, 224 conflicts were reported in 2013, which involved 2,791,302 hectares and 127,886 people. Significantly, 80% of such conflicts started since 2000 [55], i.e., since the soybean's expansion outside the Pampas sped up.

A leafy scholarly literature has reported a wide range of coercion mechanisms used in order to loot and misappropriate the peasants' and aborigines' lands. On one hand, some manipulation and deception strategies allow farmers and indigenous to be evicted without major difficulties (e.g., signing blank documents that actually are lending or eviction agreements) [56, 57]. On the other hand, political and legal power operate as dispossession guarantors by both ordering evictions for indigenous and peasants and accepting the fake company-owned documents as legal. Such support often involves the entire repressive apparatus of the State, from judges and lawyers to congressmen and public forces of security, who grab the rural families' lands to put them under the control of Buenos Aires, Córdoba, Santa Fe, and Tucumán's soybean companies [52, 57].

Finally, dispossession of the land implies nonlegal actions too, even paramilitarization. Physical wounds and even death are the result of territorial struggles unchained by the agribusiness logic [53]. Several strategies are commonly used on this regard, such as *de facto* occupations, even when peasants have got legal documentation that legitimized their land rights, land enclosures and deforestation, and blocking access to roads, grazing areas, and drinking water sources. Furthermore, the so-called white guards, i.e., civilian paid by the soybean producers, intentionally pollute water wells, kill livestock and farm animals and pets, threat farmers, fire ranches, and even murder peasants and aborigines [45]. One of the most affected provinces is Santiago del Estero, where 122 conflicts were reported in 2013, over a total of 224 [55]. The misappropriation of almost 4 million hectares in this province has implied evictions, violations of human rights, and even deaths. Often real states agencies sell lands with its inhabitants



inside, then vacating and guarding them by using provincial police's special brigades. Such complicity chain includes entrepreneurs, lawyers, notaries, judges, and congressmen too [52, 55]. Similar practices have been reported in Salta [58].

#### **4. Environmental and socio-ecological issues: deforestation, degradation, and the health question**

Silent enclosures and undisguised strategies of violence have been complemented by deforestation. Almost 5 million hectares of native forests were cut down in just 16 years (1998–2014) [59], a figure that means 4.3% of world deforestation, according to the International Panel on Climate Change [57]. In fact, the national annual rates of deforestation fluctuate from 0.49 to 1.31%, i.e., figures 3.5 and even 9.4 times bigger than the world annual averages (0.22 to 0.14%) estimated during the period 1990–2010 [59–62]. Although this serious question led to deforestation was restricted and even banned by the State, illegal logging continues because of the unceasing expansion of the agricultural frontier [57].

Soybean's advance has been the major driver of forest area reduction between 2002 and 2011 [59], as well as an indirect deforestation driver too, though it has expelled traditional productions from its historical cores (e.g., cotton, sugar cane, stockbreeding, etc.). Remarkably, 95.8% of cleared area (4,754,747 hectares) involved provinces that belong to both the soybean core's area and the peripheral regions recently conquered by the soybean's expansion. As shown by **Figure 2**, deforestation map mainly involves soybean provinces, such as Santiago del Estero, Salta, Chaco, Córdoba, Entre Ríos, and Formosa, which concentrate 85.2% of the logged area in the whole country. Moreover, such provinces have substantially exceeded both the national and world averages. For instance, the deforestation rate of the north of Córdoba during the period 1998–2006 was 13 times bigger than the world rate, whereas the Santiago del Estero's logging speed during the period 2006–2014 was 7–19 times bigger than the international average. Finally, Salta is currently known as the "capital of logging." This is because the government uses to modify the regionalization established by the Forests Law in order to satisfy the soybean firms' requirements. In addition, foremen, corporations, and organisms strongly pressure aborigine communities by demanding them to sign deforestation permits or to accept the logging of conservation areas in exchange of water, food, and ambulances [57].

Soybean's boom is also one of the major responsibility for the growth of greenhouse gases' emissions, the loss of biodiversity, and the increasing frequency of floods and rockslides in our country. Likewise, soybean is the main crop involved in desertification process, due to the for free-exports of virtual water and essential edaphic resources (e.g., nitrogenous, phosphor, potassium, calcium, magnesium, sulfur, iron, manganese, boron, zinc, molybdenum, chlorine, copper, etc.) [29, 30]. Environmental degradation (specially, deforestation) completes the expulsion of Aborigines by destroying their ethnical, cultural, and socio-economic subsistence matrix. Indigenous population of the Argentinean North was estimated in 900,000 people in the beginning of the 2000s, the half of whom have been condemned by deforestation to begin

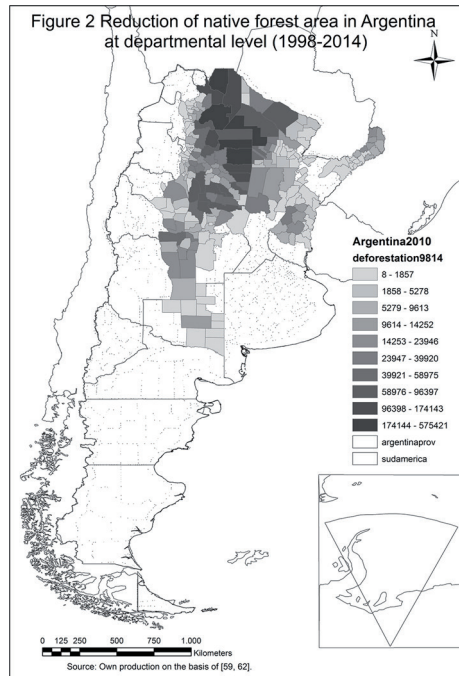


Figure 2. Reduction of native forest area in Argentina at departmental level (1998–2014).

big and medium-size cities of the provinces of Santa Fe, Chaco, Formosa, Salta, Misiones, and Buenos Aires [14]. Thickening the extreme misery and poverty's urban belts, such masses of dispossessed often suffer starvation and restricted access to drinking water, as well as high levels of child mortality due to the migration of zoonotic illnesses (e.g., hanta virus, dengue, leishmaniasis, etc.) from the forest to the cities [58].

Another serious implication of soybean agribusiness is the health issue caused by the massive fumigations with agrochemicals. National agrochemical consumption has exponentially grown since the introduction of transgenic soybean and its technological package, climbing from 39 liters in 1991 to 335 million of liters in 2012. While in other countries the use of agrochemicals does not use to exceed 3 liters per hectare, the national average is 12 liters per hectare, reaching peaks of 20 liters in Santiago del Estero and Chaco. Such values would imply that each Argentinean inhabitant is exposed to a dose of 8 liters of agrochemicals, whereas this figure would oscillate from 30 to 60 liters per capita in the soybean regions [63]. Soybean agrochemicals' package includes glyphosate of ammonium and other global-action herbicides, insecticides, and fungicides, such as cypermethrin, chlorpyrifos, paraquat, glufosinate of ammonium, bromoxynil, malathion, 2,4-D, endosulfan, hexachlorobenzene, heptachlor, and atrazina. It is worthwhile noting that the last five agrochemicals mentioned above have been banned or restricted in several countries, whereas glyphosate of ammonium has been classified as "probably carcinogenic" by the World Health Organization in 2015.

According to the Atlas of Childhood's Environmental Risk in Argentina, the most affected departments by the use of pesticides largely matches regions that have been intensely conquered by the soybean monoculture, i.e., center and southeast of Córdoba, south of Santa Fe and Chaco, north of Buenos Aires, much of Santiago del Estero, Tucumán, and Entre Ríos, etc. (Figure 3). Soybean, in fact, is the main crop involved in the Pollution by Pesticides Index of the mentioned Atlas [64].

Soybean regions' inhabitants have reported a wide range of serious socio-economic, environmental, and health damages due to the aerial and land spraying with agrochemicals and the pollution produced by grain and pesticides' storing plants. Some of these damages have included the hives and horticultural cultivations' destruction, the mortality or/and degenerative disease of poultry and cattle, the pollution of air, soil, and surface and groundwater, and certain health issues (e.g., chronic respiratory diseases, diarrhea, dizziness, cephalalgia, nausea, vision problems, dermal rashes, hormonal disruptions, and thyroid disorders). Even more serious pathologies have been attributed to the soybean's pattern too, such as hemolytic anemia, rheumatoid arthritis, lupus, purpura, central nervous system damage, Hodgkin's disease, multiple sclerosis, cerebral ischemia, toxic liver diseases, and neurological disorders. Furthermore, other health issues have been reported in the Pampas and the Argentinean North, such as male sterility, births with congenital malformations, mutagenesis, and spontaneous abortions. Finally, even some kinds of cancer (e.g., leukemia, and urogenital, pancreatic, lung, breast, prostate,

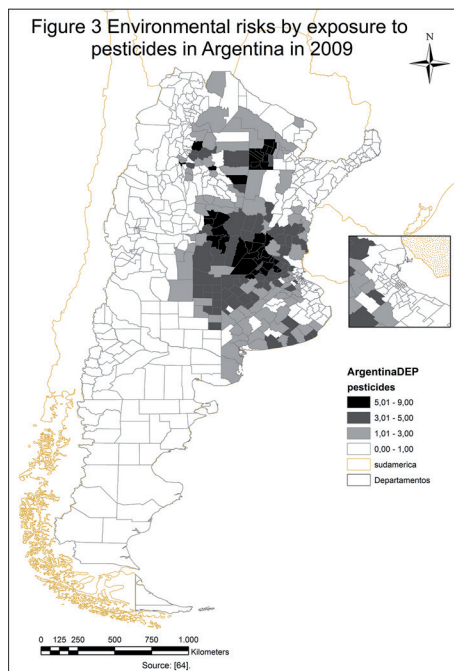


Figure 3. Environmental risks by exposure to pesticides in Argentina in 2009.

stomach, and liver cancers) have spread among the rural workers and the people living near crops and storing plants. Importantly, in soybean regions both the malformations and cancer's incidence is 2 to 10 times bigger than the national and urban averages [57, 63, 65].

## **5. Political implications: seed and agrochemical companies, farmers' autonomy, and legal and food sovereignty**

Despite the networks paradigm would seem to hide deep inequalities among the different agribusiness' agents and links, transnational corporations actually controls the whole global value chains by defining both the general parameters of the agro-industrial system and commanding the technological innovation's diffusion. During the last 20 years, the so-called transgenic revolution encouraged seed companies to develop a complex mergers and acquisitions process, which involved agrochemical and even pharmaceutical firms too. Owing to such oligopoly structure, a handful of corporations (Monsanto, DuPont, Dow Agrochemical, Bayer, Basf, Aventis, and Syngenta) control 100% of transgenic seeds market and 97.8% of agrochemical market at world scale [14, 26].

Such concentration of power allows companies to appropriate the so-called life's rent [45] and to deploy several subordination and dependence mechanisms by applying owner rights on seeds (e.g., patents, licenses, etc.) and creating new biotech packages (e.g., when a novel seed's genetic feature and an agrochemical input are combined, patented, and sold by the same company). As a consequence, farmers are prevented from easily reproducing the new seeds and forced to acquire certain pesticides and fertilizers, thus losing all the control over the first chain's link and becoming a captive market (simple germplasm's leaseholders) for the companies [14, 26].

Such is the case of the Argentinean soybean agribusiness, which are based on two inputs patented and marketed by Monsanto at world scale: the RR glyphosate-resistant soy and the glyphosate of ammonium. However, since the government approval of this crop variety only occurred in 1996, the initial, fast expansion of the new seed during the earlier years of soybean boom was due to genetic smuggling and clandestine plantations, two phenomenon actively encouraged by Monsanto [66]. As a consequence, nowadays 99.1% of the soybean planted in Argentina is transgenic [7].

From the mid-1990s onwards Monsanto has become the main agent of the whole soybean accumulation chain by using different mechanisms. On one hand, the US corporation controls both seed and agrochemical markets under almost monopolistic conditions. For instance, Nidera, the leading company of the Argentinean Seeders Association (ASA), operates as a Monsanto's license firm by marketing transgenic soybean seeds belonging to this US company [14]. Such situation has been reinforced by the Magnum Network, a system created by Monsanto in 1998 that imposes an exclusivity contract on agronomies. Owing to that exclusivity contract, agronomies cannot sell seeds of competitor firms and must accept both to adopt direct billing conditions and to provide detailed customer information by using a management system directly connected to Monsanto's sales and marketing management [12].

Likewise, the Argentinean agrochemical market brings a return of 2.5 billion dollars per year to the companies, 64% of which corresponds to glyphosate of ammonium [63]. Although such pesticide is sold not only by Monsanto, but other companies too (e.g., Syngenta, Basf, Bayer, DuPont, Dow AgroSciences, Nidera, Atanor, La Tijereta, etc.) [67], the US corporation is the one who appropriates the most part of the bulky profits generated by the sale of glyphosate. Finally, Monsanto is the Cargill's share capital owner, thus controlling a large part of the agro-industrial stage [24].

In the beginning of the Argentinean transgenic soy boom Monsanto did not strive to directly benefit from the sale of the RR seed, but focused its attention in the marketing of glyphosate [12]. As a consequence, farmers started to develop practices legally recognized by both the national legislation and the FAO's Phytogenetic Agreement, such as using the seed free of charge, sharing it with other producers, multiplying it, and even selling and/or saving it for later re-sowing. Nonetheless, Nidera and other license companies obtained in 1999, the government approval to impose an "extended royalties" system. According to that system, when farmers acquire the RR soybean seed automatically sign a contract that not only impedes them saving and/or sharing their harvest, but forces them to pay 2 dollars (plus taxes) for each 50 kilograms-bag of certified seeds they keep for planting in the following agricultural year [15].

Since such contract meant a noticeable transgression to the Argentinean Seeds Law, the extended royalties system was very resisted by the soybean producers, as well as avoided by various mechanisms. As a result, in the beginning of the 2000s, the use of certified seeds represented less than 18% of the soybean planted [66]. However, Monsanto only start the relevant formal claims when the spread of its transgenic soy in the country was absolute, its Magnum Network was already consolidated [12], and the allegedly "clandestine" practices of Argentinean farmers had favored it with the dissemination of the RR soy in Paraguay, Brazil, and Bolivia, i.e., countries where transgenic crops were still banned [66]. By using the pretext that farmers had violated the legal security of the seed industry and injured their intellectual property rights, the US company begun to deploy different mechanisms of pressure and lobbying on the Argentinean government [15].

Monsanto's first strategy was activating the royalties payment by the soybean marketed in Argentina. Due to the failure of this tactic, Monsanto asked for national government to sanction a "global royalties' law." Such law should create a Technological Compensation Fund oriented for collecting an aliquot that fluctuated 0.35–0.95% of selling price of soybean and lately distributing such resources among the seed companies [15]. Since the bitter resistance of large farmers determined the unfeasibility of the legislative project, Monsanto implemented other measures in 2005. By demanding a much higher fee (15% per ton) than the traditional royalty, the US company initiated litigations against Argentina in international courts and temporarily abandoned the commercialization of soybeans in the country [66]. Moreover, Monsanto fomented export blockades, achieved that European courts stopped and confiscated ships loaded with Argentinean soybean in the Old Continent's ports, and sougthed the support of congressmen, ambassadors, and politicians of the US government [57]. Although Monsanto possesses the monopoly on RR soy at world scale, such right is not valid in Argentina, since the company never patented the transgenic event there [66].

Owing to the poor results obtained by these strategies, Monsanto introduced another mechanism of coercion: controlling the later diffusion of technological change. In 2012, the US corporation patented the RR2 Intacta Pro soybean, which is not only tolerant to glyphosate (like the conventional RR variety), but also has the Bt gene—it is resistant to some insect pests. Nevertheless, Monsanto conditioned the commercialization of the new transgenic event to the production of legal frameworks (both public and private) functional to its interests. In fact, the company stipulated that its new soybean could only be acquired by those farmers who previously signed a license agreement and expressly agreed to pay “extended royalties” at the time of purchase [57].

As such system was much resisted by the soybean producers, in 2016 the National State finally decided to regulate the seed market and operate as a guarantor of the Monsanto’s intellectual property rights. On the one hand, the government confirmed the validity of the contracts previously signed between the company and the farmers. On the other hand, the State determined that the control of the origin (legal or illegal) of the seed should be carried out by the National Seed Institute (INASE). If the RR2 soybean’s origin is illegal, INASE will apply sanctions and allow the seed companies to make payment claims to producers, around 12 dollars per ton [68]. Finally, this situation would be reinforced by the imminent sanction of a new law of seeds, which will establish that only small farmers will be able to keep seeds for free for later use, whereas larger farmers will be forced to tax companies.

## 6. Conclusions

Since accumulation chains reveal the spatiality of a cycle of rotation and reproduction of capital, the Argentinean soybean agribusiness provides a vast, exhaustive variety of empirical examples regarding the different conflicts and mechanisms of domination and subordination developed both inside and outside the agricultural-based production circuits. Undoubtedly, soybean fever has introduced a historical breakpoint in the evolution of the national rural sector and so has created an insoluble paradox: the more soybean boom expands—thus capping more than half of the grain area and beating harvest records from year to year, the greater the reduction of the amount of farms is.

Three accumulation cores may be identified within the soybean chain. The first corresponds to a primary stage’s privileged stratum: the large agricultural production units. Nonetheless, the boundaries between this sector and the rest of the agribusiness’ links are diluted due to the rising of an unprecedented phenomenon: the enormous weight acquired in primary production by both extra-agricultural agents and the tenants of fields (and not by their owners, as was usual). Such is the case of soybean sowing pools, i.e., conglomerates where different capitalist factions converge and overlap, combining the new leasing practices and the typical strategies of purchasing of lands.

Second soybean chain’s accumulation core is the oil and flour industry, a link characterized by high levels of concentration and foreignization. Such agro-industry has intensely developed several strategies of backward and forward integration. For instance, oil firms have acquired and/or leased of vast tracts of land in order to ensure a stable supply of raw material at low



cost, thus reinforcing its control over the productive circuit's primary stage. Moreover, these companies have expanded to other chain' stages, such as producing biodiesel and commanding both the transportation and the foreign trade flows.

Owing to the strategies of both accumulation cores, rural property is more and more concentrated in few hands, thus eroding the small and medium-sized farmer's autonomy. Importantly, such phenomenon is linked, likewise, to the production of the new territorial enclosures in the Pampas' edge and the Argentinean north. Deceptions and manipulations, usurpations and evictions, blockades and repression, intimidation and assassinations are the spurious practices deployed by agro-industries, landowners and sowing pools in order to grab lands and push aborigines and peasants to move to the urban belts of poverty and misery. In addition, soybean production not only leaves a wake of environmental destruction (e.g., deforestation, loss of biodiversity, free exports of soil and virtual water, desertification, etc.), but is also responsible for an even more perturbing question: the considerable amount of serious sanitary damages suffered by the population near cultivations, plants, and silos, due to the aerial and terrestrial spraying with pesticides and the agro-industrial pollution. As the State captures a substantial part of the bulky soybean income by collecting exports taxes, it operates as silent witnesses (even a guarantor) of such processes of subjugation and devastation.

Finally, the third accumulation core is the transnational seed and agrochemical industry. Operating behind the shadows, this industry remotely commands -both technically and politically- the whole soybean agribusiness by using a myriad of mechanisms (e.g., networks of license firms, technological change's diffusion, ownership of one of the main grain traders in the world, intellectual property royalties' claims, political power, etc.). Such accumulation strategies have not only led to the growth of the farmers' dependence and the loss of legal and food sovereignty but have created a buried chain of subordination and exploitation that even affects one of the circuit's accumulation cores -the large agricultural producers-, thus generating harsh conflicts of power on the distribution of profits. Interestingly, political control and economic surplus of the soybean chain precisely accumulate in the stages (seed and agrochemical companies, oil and flour industries), which least contribute to the generation of value -8 and 10%, respectively, against 73% of primary production [41].

To sum up, all the implications aforementioned (alike the activity's small incidence on the employment's generation) suggest that the soybean value chain should be considered as an irrational use of territory for most of national society.

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## References

- [1] Santos M, Silveira ML. O Brasil. Território e sociedade no início do século XXI. Rio de Janeiro-São Paulo: Record; 2001. 471 p
- [2] Lobato Corrêa R. Interações espaciais. In: De Castro IE, Da Costa Gomes PC, Lobato Corrêa R, editors. Explorações geográficas. Percursos no fim do século. São Paulo: Bertrand; 1997. pp. 279-318
- [3] Austin J. Agribusiness in Latin America: A Case Book on Agribusiness Management. New York: Praeger; 1974. 322 p
- [4] Moraes ACR. Los circuitos espaciales de producción y los círculos de cooperación en el espacio. In: Liberali AM, Yanes L, editors. Aportes para el estudio del espacio socio-económico (III). Buenos Aires: El Coloquio; 1986. pp. 151-177
- [5] Cariola C, Lacabana M. Circuitos de acumulación: una perspectiva de análisis integral para la planificación regional. Cuadernos del CENDES 5 Planificación en Venezuela. 1986;5(2):65-110
- [6] Rofman A. Las economías regionales a fines del siglo XX. Los circuitos del petróleo, del carbón y del azúcar. Buenos Aires: Ariel; 1999. 240 p
- [7] Palmisano T. Los señores de la tierra. Transformaciones económicas, productivas y discursivas en el mundo del agro bonaerense [thesis]. Buenos Aires: UBA; 2014
- [8] Gudynas E. Diez tesis urgentes sobre el nuevo extractivismo. Contextos y demandas bajo el progresismo sudamericano actual. In: Schuldt J, Acosta A, Barandiarán A, Bebbington, A, Folchi M, CEDLA, Alayza A, Gudynas E, editors. Extractivismo, política y sociedad. Quito: CAAP-CLAES; 2009. pp. 187-225
- [9] MINAGRI. Estimaciones agrícolas. Series históricas. Buenos Aires: Ministerio de Agroindustria; 2016. Available from: <https://datos.magyp.gob.ar/reportes.php?reporte=Estimaciones>
- [10] Pierri J. El boom de la soja. Un retorno al pasado. Realidad Económica. 2006;219:53-65
- [11] Giancola SI, Salvador ML, Covacevich M, Iturrioz G. Análisis de la cadena de soja en la Argentina. Estudios Socioeconómicos de los Sistemas Agroalimentarios y Agroindustriales N° 3. Buenos Aires: INTA; 2009. 119 p
- [12] Gras C, Hernández V. Radiografía del nuevo campo argentino. Del terrateniente al empresario transnacional. Buenos Aires: Siglo Veintiuno; 2016. 299 p
- [13] Giarracca N, Teubal M. El campo argentino en la encrucijada: estrategias y resistencias sociales, ecos en la ciudad. Buenos Aires: Alianza Editorial; 2005. 514 p
- [14] Pengue W. Agricultura industrial y transnacionalización en América Latina. "La transgénesis de un continente". Buenos Aires: PNUMA; 2005. 221 p

- [15] Teubal M. La expansión del modelo sojero en Argentina. De la producción de alimentos a los commodities. *Realidad Económica*. 2006;**220**:71-96
- [16] Rulli J. Repúblicas unidas de la soja. Realidades sobre la producción de soja en América del Sur. Buenos Aires: GRR; 2008. 294 p
- [17] Reboratti C. Un mar de soja: la nueva agricultura en Argentina y sus consecuencias. *Revista de Geografía Norte Grande*. 2010;**45**:63-76
- [18] Morina JO. Geografías de la agricultura industrial sojera en la Argentina. “Viaje de ida”. Luján: UNLu; 2010. 146 p
- [19] Gómez Lende S. El modelo sojero en la Argentina (1996-2014), un caso de acumulación por desposesión. *Mercator – Revista de Geografía da UFC*. 2015;**14**(3):7-25
- [20] Teubal M. Soja transgénica y crisis del modelo agroalimentario argentino. *Realidad Económica*. 2003;**196**:52-74
- [21] Teubal M, Rodríguez M. Agro y alimentos en la globalización. Una perspectiva crítica. Buenos Aires: Ediciones La Colmena; 2002. 208 p
- [22] Hernández V. La ruralidad globalizada y el paradigma de los agronegocios en las pampas gringas. In: Gras C, Hernández V, editors. *La Argentina rural. De la agricultura familiar a los agronegocios*. Buenos Aires: Biblos; 2009. pp. 39-64
- [23] Domínguez D, Sabatino P. Con la soja al cuello: crónica de un país hambriento productor de divisas. In: Alimonda H, editor. *Los tormentos de la materia. Aportes para una ecología política latinoamericana*. Buenos Aires: CLACSO; 2006. pp. 249-274
- [24] Ribeiro S. Transgénicos: un asalto a la salud y al medio ambiente. *Realidad Económica*. 2000;**75**:70-87
- [25] Barri F, Wharren J. El modelo del “agronegocio” en la Argentina: el paradigma cientifista-tecnológico. In: Giarracca N, Teubal M, editors. *Actividades extractivas en expansión: “reprimarización de la economía argentina”*. Buenos Aires: Antropofagia; 2013. pp. 73-96
- [26] Perelmuter T. Bienes comunes vs. mercancías: las semillas en disputa. Un análisis del rol de la propiedad intelectual en los actuales procesos de cercamientos. *Sociedades rurales, producción y medio ambiente*. 2011;**11**(22):53-86
- [27] Melón D. El comercio del “oro verde”. El patentamiento de la diversidad genética y la vida. In: Melón D, editor. *La Patria sojera. El modelo agrosojero en el Cono Sur*. Buenos Aires: Editorial El Colectivo; 2014. pp. 59-74
- [28] Altieri MA, Pengue W. La soja transgénica en Argentina: una maquinaria de hambre, deforestación y devastación socio-ecológica. *Ecología Política Cuadernos de Debate Internacional*. 2005;**30**:87-93
- [29] Pengue W. Agua virtual, agronegocio sojero y cuestiones económico-ambientales futuras. *Realidad Económica*. 2006;**223**:58-77

- [30] Pengue W. Suelo virtual, biopolítica del territorio y comercio internacional. *Fronteras*. 2010;7:12-25
- [31] Gómez Lende S. Orden global, “orden irracional” Agricultura de exportación, devastación de bosques nativos y crisis socio-ambiental en Argentina. *Ensayos e Investigaciones Geográficas*. 2009;7(VII):37-52
- [32] Gómez Lende S, Velázquez G. Orden global, reestructuración productiva y crisis ambiental: análisis de la relación entre deforestación, soja transgénica y silvicultura en la Argentina contemporánea. In: Cacace GP, Gómez ME, Morina JO, Suevo ME, editors. *Geografías regionales y extractivismos en la Argentina de los Bicentenarios*. Luján: UNLu; 2013. 23-86
- [33] Rodríguez Striebeck MP. Territorios en disputa. Conflictos por el acceso y uso de la tierra. In: Melón D, editor. *La Patria sojera. El modelo agrosojero en el Cono Sur*. Buenos Aires: Editorial El Colectivo; 2014. pp. 107-121
- [34] Carrasco A. Glyphosate affects development in *Xenopus* embryos. In: 68th Meeting of Developmental Biology Society; 23-27 July 2009. San Francisco: Society for Developmental Biology; 2009
- [35] Domínguez D, Sabatino P. La muerte que viene en el viento. La problemática de la contaminación por efecto de la agricultura transgénica en Argentina y Paraguay. In: VVAA, editors. *Los señores de la soja. La agricultura transgénica en América Latina*. Buenos Aires: Ediciones Ciccus-CLACSO; 2010. pp. 31-121
- [36] Verzeñassi D. El modelo agrosojero y su impacto en nuestras vidas. In: Melón D, editor. *La Patria sojera. El modelo agrosojero en el Cono Sur*. Buenos Aires: Editorial El Colectivo; 2014. pp. 31-48
- [37] Sández F. La Argentina fumigada. Agroquímicos, enfermedad y alimentos en un país envenenado. Buenos Aires: Espejo de la Argentina-Planeta; 2016. 455 p
- [38] Gómez Lende S. Usos del territorio, acumulación por desposesión y derecho a la salud en la Argentina contemporánea: el caso de la soja transgénica. *GEOgraphia – Revista do Programa de Pós-Graduação em Geografia da Universidade Federal Fluminense*. 2017;19(39):3-15
- [39] INDEC. Exportaciones según complejos exportadores. Año 2014. Buenos Aires: Instituto Nacional de Estadística y Censos; 2015. Available from: [https://www.google.com.ar/?gws\\_rd=ssl#q=Exportaciones+seg%C3%BAAn+complejos+exportadores.+A%C3%B1o+2014+Indec+excel](https://www.google.com.ar/?gws_rd=ssl#q=Exportaciones+seg%C3%BAAn+complejos+exportadores.+A%C3%B1o+2014+Indec+excel)
- [40] INDEC. Evolución de puestos de trabajo y promedios de remuneraciones y costo salarial de los asalariados registrados. Segundo trimestre 2015. Buenos Aires: Instituto Nacional de Estadística y Censos; 2015. 23 p
- [41] Anlló G, Bisang R, Salvatierra G. Cambios estructurales en las cadenas agropecuarias. De lo primario a las cadenas globales de valor. Santiago de Chile: CEPAL; 2010. 101 p

- [42] INDEC. Censo Nacional Agropecuario 2008. Resultados definitivos por provincias y departamentos. Buenos Aires: Instituto Nacional de Estadística y Censos; 2016. Available from: [http://www.indec.gov.ar/nivel4\\_default.asp?id\\_tema\\_1=3&id\\_tema\\_2=8&id\\_tema\\_3=87](http://www.indec.gov.ar/nivel4_default.asp?id_tema_1=3&id_tema_2=8&id_tema_3=87)
- [43] MECON. Complejo oleaginoso. Serie Producción regional por complejos productivos. Buenos Aires: Ministerio de Economía y Finanzas Públicas; 2011. 28 p
- [44] Silveira ML. Um país, uma região. Fim de século e modernidades na Argentina. São Paulo: LABOPLAN-USP; 1999. 488 p
- [45] Morina JO, Cacace GP. Capitalismo agrario y expansión sojera en la Argentina: “un extractivismo sin retorno” In: Cacace GP, Gómez ME, Morina JO, Suevo ME, editors. Geografías regionales y extractivismos en la Argentina de los Bicentenarios. Luján: UNLu; 2013. pp. 287-328
- [46] INDEC. Censo Nacional Agropecuario 1988. Resultados definitivos por provincias y departamentos. Buenos Aires: Instituto Nacional de Estadística y Censos; 1995. 425 p
- [47] Gras C. Expansión agrícola y agricultura empresarial. El caso argentino. Revista de Ciencias Sociales. 2013;26(32):73-92
- [48] CIARA-CEC. Estadísticas nacionales. Buenos Aires: Cámara de la Industria Aceitera de la República Argentina; 2016. Available from: <http://www.ciara.com.ar/estadisticasNac.php>
- [49] Toledo López V. Los agrocombustibles como un eje del extractivismo en la Argentina. In: Giarracca N, Teubal M, editors. Actividades extractivas en expansión: “reprimarización de la economía argentina” Buenos Aires: Antropofagia; 2013. pp. 137-158
- [50] CAC. Perfiles exportadores provinciales 2015. Buenos Aires: Cámara Argentina de Comercio; 2015. 58 p
- [51] Teubal M. Soja y agronegocios en la Argentina: la crisis del modelo. Lavboratorio. Estudios sobre cambio estructural y desigualdad social. 2008;10(22):5-7
- [52] Klippahn A, Enz D, Tierras SA. Crónicas de un país rematado. Buenos Aires: Aguilar; 2006. 254 p
- [53] Giarracca N, Palmisano T. Tres lógicas de producción de alimentos: “Hay alternativas al agronegocio” In: Giarracca N, Teubal M, editors. Actividades extractivas en expansión: “reprimarización de la economía argentina” Buenos Aires: Antropofagia; 2013. pp. 19-44
- [54] MINAGRI. Relevamiento y sistematización de problemas de tierra de los agricultores familiares en la Argentina. Buenos Aires: Ministerio de Agricultura, Ganadería, Pesca y Alimentación; 2013. 96 p
- [55] REDAF. Conflictos sobre tenencia de tierra y ambientales en la región del Chaco argentino 3° informe. Reconquista: Red Agroforestal Chaco Argentina, Observatorio de Recursos Naturales, Tierras y Medioambiente; 2013. 100 p

- [56] Naharro N, Álvarez A. Estudio de caso: acaparamiento de tierras y producción de soja en territorio wichí. Salta-Argentina. Salta: Brot für die Welt-Asociación; 2011. 39 p
- [57] Aranda D. Tierra arrasada. Petróleo, soja, pasteras y megaminería. Radiografía de la Argentina del Siglo XXI. Buenos Aires: Sudamericana; 2015. 430 p
- [58] Delgado O. La ruta de la soja en el Noroeste Argentino. In: Rulli J, editor. Repúblicas unidas de la soja. Realidades sobre la producción de soja en América del Sur. Buenos Aires: GRR; 2008. pp. 132-158
- [59] SAyDS. Monitoreos de la superficie de bosque nativo de la República Argentina. Períodos 1998-2002, 2002-2006, 2006-2011, 2011-2013 y 2013-2014. Regiones forestales Parque Chaqueño, Yungas Selva Paranaense y Espinal. Buenos Aires: Secretaría de Ambiente y Desarrollo Sustentable de la Nación; 2007-2015. 772 p
- [60] FAO. Situación de los bosques del mundo 2007. Roma: Organización de las Naciones Unidas para la Agricultura y la Alimentación; 2007. 157 p
- [61] FAO. El estado de los bosques del mundo 2012. Roma: Organización de las Naciones Unidas para la Agricultura y la Alimentación; 2012. 51 p
- [62] Vallejos M, Volante JN, Mosciaro MJ, Vale LM, Bustamante ML, Paruelo JM. Transformation dynamics of the natural cover in the Dry Chaco ecoregión: A plot level geo-database from 1976 to 2012. *Journal of Arid Environments*. 2015;123:3-11
- [63] REDUAS. Informe 1° Encuentro Nacional de Médicos de Pueblos Fumigados. Córdoba: Facultad de Ciencias Médicas, Universidad Nacional de Córdoba; 2013. 40 p
- [64] DPN. Niñez y riesgo ambiental en la Argentina. Buenos Aires: Defensor del Pueblo de la Nación; 2009. 77 p
- [65] GRR. Pueblos fumigados. Los efectos de los plaguicidas en las regiones sojeras. Buenos Aires: Grupo de Reflexión Rural, Editorial del Nuevo Extremo; 2009. 254 p
- [66] Ribeiro S. Monsanto y la soya argentina. *La Jornada*; 2005. Available from: <http://www.etcgroup.org/es/content/monsanto-y-la-soya-argentina>
- [67] CONICET-MSN. Informe-Evaluación de la información científica vinculada al glifosato en su incidencia sobre la salud humana y el ambiente. Buenos Aires: Consejo Científico Interdisciplinario, CONICET-Ministerio de Salud de la Nación; 2009
- [68] Bertello F. Para el Gobierno, se terminó el conflicto con Monsanto. *Diario La Nación*; 2016. Available from: <http://www.lanacion.com.ar/1911960-para-el-gobierno-se-termino-el-conflicto-con-monsanto>