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Agrarian extractivism in Bolivia

Ben McKay

1 Introduction

The expansion of Bolivia's agricultural frontier fueled by the soy complex has become part of the state's three-pronged extractivist development model (minerals, hydrocarbons, soybeans). While Bolivia has a long history of mineral extraction, the agricultural sector's highly-mechanized and capital-intensive character are relatively new developments. The penetration of new forms of capital into agriculture in Bolivia's lowlands is transforming the rural landscape, altering social relations of production, property, and power, and threatening present and future land and resource access by the rural majority, principally small-scale farmers and indigenous peoples. This type of agricultural expansion – what is referred to here as agrarian extractivism – is characterized by four interlinked dimensions: (1) large volumes of materials extracted destined for export with little or no processing; (2) value-chain concentration and sectoral disarticulation (3) high intensity of environmental degradation; and (4) deterioration of labour opportunities and/or labour conditions. It is argued here that 'agrarian extractivism' is a politically and analytically useful concept for understanding new dynamics and trajectories of agrarian change as it reveals the very extractive nature of capitalist agriculture, particularly in the context of contemporary land grabbing, flex crops, and the increasingly corporatized agro-food system. Agrarian extractivism is not used synonymously with industrial capitalist agriculture, nor is it only in reference to soybean production. It characterizes the very extractive dimensions of certain types of capitalist agriculture which have developed unevenly around the world. Rather than a form of *industrial* agricultural development which implies value-added processing, sectoral linkages, and employment generation, agrarian extractivism challenges this dominant discourse, revealing its negative socio-economic and environmental implications for rural development.

This paper is organized as follows: the next (second) section provides a conceptual distinction among the conventional 'extractivist' discourse, the new or 'neo'-extractivism in Latin America and the more recent emergence of agro-, agricultural, and agrarian extractivism. The third section analyzes Bolivia's soy complex with regards to four interlinked dimensions of agrarian extractivism, revealing the economic, social and environmental extractivist dynamics which characterize soybean production in the eastern lowlands of Santa Cruz. The fourth section concludes the paper by re-iterating the main arguments put forth and the need to challenge dominant discourses of industrial agriculture by revealing their extractive dynamics.

2 Extractivism, Neo-Extractivism, and Agrarian Extractivism

Extractivism

By means of both colonial coercion and post-colonial 'consent' via political-economic institutional arrangements, 'extractivism' has broadly characterized the relationship between the industrialized 'North' and developing 'South' – that is, the exploitation, control and export of raw materials from the latter to fuel the industrial development of the former. Natural resource extraction has generally come to plague the industrial development of raw material export economies by means of economic distortions such as the 'Dutch disease' and the Natural Resource Curse (Paradox of Plenty). Indeed, extractivism has been central to 'Latin American theories of development and underdevelopment' from export-oriented to import-substitution industrialization (ISI) strategies (see Kay, 1989).

The term 'extractivism' is by no means a new or novel concept. Extractivism broadly refers to "those activities which remove large quantities of natural resources that are not processed (or processed only to a limited degree), especially for export" (Acosta, 2013, p. 62). To be more precise, Gudynas

classifies extractivism based on three dimensions: (1) high volume of resources extracted; (2) high intensity of environmental impacts; and (3) resources destined for export with little or no processing (Gudynas, 2013). Rather than measuring extractivism by the weight of the raw material (in tons, bushels, cubic meters or barrels), Gudynas argues for accounting methods which include material and energy flow analysis such as Material inputs per unit of service (MIPS) and the ecological rucksack (see Schmidt-Bleek, 1999). This definition distinguishes extractivism from other forms of natural resource appropriation by its high intensity of environmental impacts – toxification, contamination, pollution, soil degradation, deforestation, etc. Finally, extractivism includes only those resources which are exported as a raw material or partially processed (Gudynas, 2013). As such, extractivism is not synonymous with mining or agricultural production, but has distinct characteristics in terms of quantity, intensity, processing and destination. Furthermore, Acosta's notion of extractivism as a 'mode of accumulation' entails "the deep structural logic of production, distribution, exchange, and accumulation" (Chase-Dunn & Hall, 2000, p. 86) and is therefore not simply a technical system of processing nature through labour, as suggested by Garcia Linera (2013). Similarly, Gudynas (2015), building off Bunker's (1985) notion of 'modes of extraction', introduces the concept of 'modes of appropriation' which describes the different ways of organizing the appropriation of distinct natural resources in specific social and environment contexts (Gudynas, 2015:189). Garcia Linera conceptualizes extractivism "as the activity that simply extracts raw materials (renewables or non-renewables)" and therefore does not distinguish between the small-scale pluri-activity of indigenous populations living in protected areas known as Extractivist Reserves (*Reserva Extrativista, ResEx*) in Brazil (see Fearnside, 1989) with open-pit mining in Potosi or monocrop soybean production in Santa Cruz.

In the current phase of global capitalism guided by neoliberal economic principles of deregulation, trade liberalization, and privatization, it is the multinational corporations who have come to monopolize extractive industries worldwide – whether mineral, hydrocarbon, or agrarian extractivism – continuing a 'mode of accumulation and appropriation' that resembles that of the colonial era. During 1980s and 1990s, extractivism in Latin America was characterized by a limited role of the state, the liberalization of capital flows and flexible labour, environmental and territorial regulations (Gudynas, 2010b, p. 3). Whether foreign or domestic capital, investment in extractive sectors has rarely been effective at building forward and backward linkages for productive integration with other complementary sectors. As Acosta puts it, "an additional classical characteristic of these primary production exporting economies … is that they are enclaves: the oil sector or the mining sector, as well as many export-oriented farming, forestry or fishing activities, are usually isolated from the rest of the economy" (2013, p. 67). This is largely due to the fact that transnational corporations have come to dominate extractivist projects, bringing much needed capital investment and technology to capital-poor but resource-rich areas with little interest in building linkages with other sectors of the domestic economy since the extractivist mode of accumulation and appropriation is fueled by external markets in the 'North' and emerging economies such as China and India. Extractivism is characterized by social and sectoral disarticulation from the rest of the economy, meaning that the capacity to consume is developed externally (demand for exports) and thus not dependent on a robust internal market or domestic demand (de Janvry, 1981, p. 34).

But after decades of resource and labour exploitation and continued impoverishment, social movements and a political left swept through Latin America during the past fifteen years promising redistributive reforms and a break with the logic of the neoliberal Washington Consensus. With an increased role of the state and variegated degrees of challenging neoliberal policies, a new type of extractivist project has emerged labeled as new or 'neo'-extractivism.

New or 'Neo' Extractivism

The new extractivism refers to the increased role of the state in extractive sectors through the nationalization of key industries, public-private partnerships and increased collection of royalties and taxes in order to fund social programmes and "ensure a more equitable sharing of the resource wealth" (Gudynas, 2013; Veltmeyer, 2013). With a particularly Latin American focus, new extractivism has

sparked interests among many scholars as to whether or not it represents a break with conventional 'extractivist' projects, altering exploitative relations of production, or maintains a similar productive and exploitative logic while funnelling resources to the poor in a residual way in order to maintain legitimacy (Acosta, 2013; A. Bebbington & Humphreys Bebbington, 2011; A. J. Bebbington, 2009; Gudynas, 2009, 2013, 2015; Seoane, Taddei, & Algranati, 2013; Svampa, 2013; Veltmeyer, 2013; Veltmeyer & Petras, 2014). Rather than the continued dependence on the export of raw materials by transnational corporations, the increased role of the state in extractive sectors was, and continues to be, promoted by progressive-left governments in Latin America as a means to reclaim sovereignty over the country's resources, redistribute the rents in the form of social policies and initiate a process of value-added industrialization.

Of course, the Latin American 'Left' is not a homogeneous entity and these 'new' extractivist dynamics play out differently in their own specific contexts, as can be said with conventional extractivist projects. However, the consensus among leading scholars mentioned above is that the 'new extractivism' has not only continued resource extraction under a similar productive and exploitative logic as their predecessors, but is characterized by increased expansion into new frontiers and greenfield sites justified with popular discourses of social welfare. As Eduardo Gudynas, credited with coining the term 'neo-extractivism' points out, "this (the promotion of new extractive sectors) is the case with mining in Correa's administration in Ecuador, the support of new iron and lithium mining in Bolivia, the strong state advocacy in promoting the growth of mining in Brazil and Argentina, and, at the same time, the Uruguayan Left participates in prospecting for oil off its coast" (Gudynas, 2010b, p. 2). For Gudynas, the new extractivism has become, in large part, a component of the new Latin American left project based on a similar logic of accumulation and modernization as the neoliberal and neoclassical approaches, whereby "(the state) end(s) up reproducing the same productive processes, similar relations of power, and the same social and environmental impacts" (Gudynas, 2010b, p. 12).

This is a similar reading to that of Bebbington and Humphreys-Bebbington (2011) who find that the underlying logics and socio-environmental consequences of extractivist projects in neoliberal states such as Peru and so-called 'post'-neoliberal states such as Bolivia and Ecuador "seem very similar regardless of the political project or ideological model" (141-142). While in Bolivia and Ecuador, the Constitution has been rewritten to grant different forms of autonomy, territory and benefits from the extraction of resources to indigenous peoples, Bebbington and Humphreys-Bebbington observe that "Peru, Ecuador and Bolivia also share a growing intolerance of resistance to this policy and each have greeted this intolerance with increasingly harsh rhetoric, criminalisation of protest (or at least threats to this effect), and a tendency on the part of their executive branches to emit proposals for legislative reform that reduce the scope for the exercise of citizen voice during the project cycle of extractive investment" (2010, 140). This has become increasingly evident in Bolivia where legislative reform under Supreme Decree 2366 of May 20 2015 allows hydrocarbon exploration within protected areas, opening up 22 protected areas and roughly 24 million hectares of land for hydrocarbon extraction (Campanini, 2015). Extractivism in Bolivia is indeed part of a broader development plan for industrialization, as stated by Vice President Garcia Linera during an event held by the United Nations Development Programme (UNDP) on its Human Development Report for Latin America and the Caribbean, declaring that Bolivia will continue to use 'extractivismo' for decades to come (Corz, 2016).

The new 'extractivism' in Bolivia

For Bolivia's Vice President, the new extractivism is "the only technical means [we have] to distribute the material wealth…and to allow us to have the material, technical and cognitive conditions to transform its technical and productive base" (Garcia Linera, 2012, p. 34). Bolivia's extractivist project "is not a goal in itself, but can be the starting point for overcoming extractivism itself" (2012, 33). Garcia Linera asserts that in Bolivia, the point of extractivism is to meet the needs of the population, to create wealth with equitable distribution and build upon it a new non-extractive material base to preserve and expand the benefits of the working population (2012).

Since 2006, the Bolivian state has increased its share of the domestic economy from 15 per cent to 38 per cent and now controls some 43 companies in strategic sectors such as hydrocarbons, telecommunications, electricity, mining, aeronautics, cement, among others (Lazcano, 2013; Varela Mendoza, 2014). Most notably was the nationalization of hydrocarbons sector and several adjustments to the mining sector, including the nationalization of the Huanuni mine and favorable policies for mining cooperatives. In 2014, state mining companies represented just 8.66% of the total production value, while private mining companies and cooperatives represented 47.4% and 43.94% respectively (Fundación Jubileo, 2016). The nationalization of the hydrocarbon sector re-established the country's natural gas as property of the state with non-transferable concessions, bought back shares from companies which had previously taken over state enterprises during the 'capitalization' of the 1990s, and renegotiated price contracts. Of most significance however was the Hydrocarbon Law (3058) passed in 2005 during the Carlos Mesa presidency which increased taxes on hydrocarbon extraction and commercialization from 18% to 50%. In 2014, extractivist rents from the Direct Hydrocarbon Tax (IDH) (17.5%), hydrocarbon royalties (9.8%), and mining royalties (1.3%) accounted for 28.6% of total state revenues from taxes and royalties (Villegas, 2015). Tax and royalty increases coincided with a commodities boom and heightened demand which increased the state's fiscal budget some 445 per cent – from USD $5.9 billion in 2005 to USD $32.1 billion in 2015[1] (MEFP, 2015). Despite the increased fiscal capacity of the state, little progress has been made in the way of value-added industrialization as the country's exports remain dependent on raw materials. From 2006 to 2013, primary product exports, as a share of total exports, increased from 89.4% to 96% (ECLAC, 2014).

Bolivia´s Vice President conceptualizes extractivism "as the activity that simply extracts raw materials (renewables or non-renewables)" and "without introducing greater transformation in the work performed, then all societies in the world, capitalist or non-capitalist, are also to a greater or lesser degree extractivist" (Garcia Linera, 2012, p. 32). For Garcia Linera, the central debate rests upon the relations of production when processing nature through labour, yet his analysis disregards extractivism as a mode of accumulation or appropriation as argued by Acosta (2013) and Gudynas (2015). Acosta and Gudynas of course recognize the literal meaning of the word extraction, but go beyond the semantics to an analysis of the relations and forms of natural resource extraction in Latin America. Garcia Linera, however, refutes critiques of Bolivia´s extractivist development model by first defending extractivism in the simple literal sense of 'to pull or draw out' resources which as a technical system of processing nature through labour has nothing to do with injustices, exploitation or inequality and "can be present in pre-capitalist, capitalist or communitarian societies" (Garcia Linera, 2012, p. 34). Second, Garcia Linera and the MAS government defend extractivism on the basis of the very need to "distribute the material wealth generated through extractivism…to have the material, technical and cognitive conditions to transform its technical and productive base" (Garcia Linera, 2012, p. 34). Opposition to extractivism is labeled as a form of imperialism, or 'green imperialism', whereby "the governments of rich nations now use environmental concerns to promote policies that deny underdeveloped nations the right to control and manage their own resources" (Fuentes, 2011). This was the strategy used regarding the infamous TIPNIS case whereby the government defended the construction of a highway through the national park by means of resource nationalism, claiming that rather than violating indigenous rights and threatening the environment, the highway would secure better access to markets, health services and spur development (Pellegrini, 2016). The MAS government, led by one of its leading Marxist scholars Garcia Linera, has gone on the attack to defend extractivism, claiming that "behind the recently constructed 'extractivist' criticism of the revolutionary and progressive governments, then, lies the shadow of the conservative restoration" (Garcia Linera, 2012, p. 34). In his analysis of the TIPNIS case, Garcia Linera claims that any opposition to the Brazilian-financed TIPNIS highway project, whether intentionally or unintentionally, is counter-revolutionary and defends the interests of the right who want to keep Bolivia and other developing countries from development and progress. Garcia Linera writes:

[1] Converted to USD at a rate of 1 USD = 6.89 Bs. Original data from source is Bs 40.543 billion in 2005 to Bs 221.181 billion in 2015 (MEFP, 2015).

> "The tragic course of history so unfolds that the counterrevolution can come hand in hand with a faction of its own builders which, without necessarily advocating it, may as a consequence of the exacerbation of its corporatist, regional or sectoral particularism, and without taking into account the general configuration of overall social forces nationally and internationally, end up defending the interests of the conservative forces of the right and undermining their own revolutionary process. That is precisely what came to happen with the so-called 'TIPNIS march'" (Garcia Linera, 2012, p. 1).

Extractivism is therefore defended by the state as a form of resource nationalism and as a means to regain its sovereignty from external forces which have historically exploited the country´s natural resource wealth during the 'old extractivism' of colonial and neoliberal regimes. Yet, what Garcia Linera and others such as Federico Fuentes (2011) who defend neo-extractivism neglect are the relations of access and control over the resources being extracted and processed through labour as a technical system. Indeed, as Garcia Linera asserts, it is not the technical form that is the problem, or extractivism per se when defined in a literal sense of drawing out resources. Yet he fails to analyze the political economy and ecology of 'extractivismo' in Bolivia. By ignoring the very modes of accumulation and appropriation, Garcia Linera uses a very literal approach to extractivism and fails to acknowledge the underlying socio-economic and environmental implications of extractivism in Bolivia. This is why it is important to deepen our understanding of extractivism, to analyze its characteristics as a 'mode of accumulation and appropriation', not simply as a technical system or form of production (Acosta, 2013; Guydnas, 2015).

Agrarian Extractivism

Recent changes in the global political economy are putting increased pressure on land and other natural resources. In the past fifteen years, we have experienced a commodities boom, the emergence of new hubs of global capital accumulation such as the BRICS (Brazil, Russia, India, China, South Africa) and some MICs (Middle Income Countries), overwhelming scientific evidence regarding global climate change, peak oil, a food price crisis, financial crisis, and a dramatic rise in large-scale land acquisitions, or 'land grabs' (S. M. J. Borras, Franco, Gomez, Kay, & Spoor, 2012; Deininger & Byerlee, 2011). Further, the rise of 'flex crops and commodities', that is, "crops with multiple uses (food, feed, fuel, fibre, industrial material, etc.) that can be flexibly interchanged" (S. M. Borras, Franco, Isakson, Levidow, & Vervest, 2016) such as soybeans (Oliveira & Schneider, 2016), sugarcane (McKay, Sauer, Richardson, & Herre, 2016), oil palm (Alonso-Fradejas, Liu, Salerno, & Xu, 2016), among others, is not only intensifying demand for natural resources but leading to increased land use change from traditional crop production for domestic consumption to industrial crop production for export. But while the emergence of industrial agriculture, global commodity chains, and a corporate food system are not new (Kloppenburg 1988; Goodman and Watts 1994; Goodman, Sorj, and Wilkinson 1987; Friedmann 2005; McMichael 2005), the pace, character and trajectory of these agrarian changes are unprecedented. Industrial agro-capital and finance are expanding into new spaces and frontiers, leading to stark socio-economic and environmental changes with a much more extractive character.

Agriculture is already being included as a form of extractivism in the new or 'neo' extractivist literature. Gudynas, for example, has used the term agricultural extractivism to refer to agriculture oriented toward monoculture, the use of transgenics, machinery, chemical herbicides, with "little or no processing and exportation of the produce as a commodity" (2010, 2). Gudynas suggests that this is not an "industry" and using the term industry implies some kind of industrialization or value-added – not primary production for export (2013). For Gudynas, agricultural activity which is characterized by a high volume/intensity of extraction, semi-processed and destined for export is considered extractivism, with particular reference to soybean plantations in Latin America (2010a, 2010b, 2013). Giarracca and Teubal suggest the term "also applies to a certain type of agriculture in which essential resources such as water and fertile land, and biodiversity, are degraded by extractivism" (2014, p. 48). Petras and Veltmeyer use the term agro-extractivism in the context of the agrarian question of the twenty first century, arguing that what governments such as China and other international investors

"primarily seek are lands to meet their security need for agrofood products and energy, while multinational corporations in the extractive sector of the global economy are primarily concerned to feed the lucrative biofuel market by producing oil palm, sugarcane (for ethanol) and soya" or what we might refer to as 'flex crops' (2014, p. 64). Petras and Veltmeyer go on to say that "agricultural extractivism takes a number of forms, but in the current context that has dominated the debate – apart from the dynamics of land grabbing – has been what we might term the political economy of biofuels capitalism: the conversion of farmland and agriculture for food production into the production of biofuels" (2016, p. 70). Maristella Svampa, includes agribusiness and biofuels production in her understanding of the new extractivism in Latin America, "due to the fact that they consolidate a model that tends to follow a monoculture, the destruction of biodiversity, a concentration of land ownership and a destructive re-configuration of vast territories" and driven by what she calls the Commodities Consensus[2] (Svampa, 2013, pp. 118–119).

Agrarian extractivism has therefore been introduced under the umbrella of neo-extractivism to refer broadly to large-scale, intensive monocrop production for export. But what is the 'extractive' character of agrarian extractivism? Are all types of large-scale chemical-intensive monocrop plantations extractive? Evidently, this type of agricultural production can take many forms in terms of land control and use, labour relations, surplus distribution, and the social relations of consumption, reproduction and accumulation (Bernstein, 2010). Some large-scale plantations may require a large labour force, may be cooperatively owned by the workers, re-invest the surplus in the domestic economy creating forward and backward linkages, exploit dynamic inter-sectoral synergies and produce value-added consumer goods for the domestic market. Yet this type of large-scale industrial agriculture is distinct from that which is highly mechanized requiring minimal wage labour, export-oriented with little or no processing, corporate-controlled in a monopolized market and highly dependent on external chemical-based inputs. Agribusiness or agro-industry may not be inherently extractive as such, which is why it is important to specify the extractive nature of the process. Agrarian extractivism as conceptualized here builds off much of the aforementioned literature on extractivism particularly as a mode of accumulation (Acosta, 2013) and appropriation (Gudynas, 2015) as well as the three dimensions put forth by Gudynas regarding scale (volume of material extracted), ecological impacts (intensity of extraction), and resource destination (semi-processed for export) (Gudynas, 2013). As a mode of accumulation, agrarian extractivism also involves particular social relations of production and reproduction in the current phase of capitalist agriculture in which the surplus value is extracted and labour opportunities and/or conditions deteriorate via new forms of value-chain control. Taken together with Gudynas' dimensions of extractivism and inspired by the work of Alonso-Fradejas (2015)[3], agrarian extractivism is defined here by the following four interlinked features: (1) large volumes of materials extracted destined for export with little or no processing; (2) value-chain concentration and sectoral disarticulation (3) high intensity of environmental degradation; and (4) deterioration of labour opportunities and labour conditions in the area/sector. In the Bolivian context, agrarian extractivism pertains to the development and expansion of the soy complex, which includes not only land-based natural resources[4] used for soybean production, but also genetically-modified seeds, agro-chemical inputs, heavy machinery, storage facilities and processing, transportation, and the broader regional and global factors driving demand and prices (McKay, 2015; McKay & Colque, 2016).

The soy complex should be understood in the context of the broader extractivist-based economy in Bolivia, namely minerals and natural gas, and part of the state's three-pronged extractivist model of

[2] For Svampa, the 'Commodities Consensus' refers to "the beginning of a new economic and political order sustained by the boom in international prices for raw materials and consumer goods, which are increasingly demanded by industrialised and emerging countries" (Svampa 2013, 117).

[3] Alonso-Fradejas (2015) puts forth a working definition of a financialized and flexible type of agrarian extractivism in Guatemala characterized by a knowledge and metabolic rift, limited wage work opportunities and poor working conditions, and the appropriation of the surplus value and land rent by financialized capitals (2015: 491-2).

[4] Including forests and water sources

development. But while mineral and natural gas extraction contribute significantly to state revenues, the largely foreign-controlled soy complex does not. The increasing role of the state in the Bolivian economy since 2006 has coincided with a somewhat *laissez-faire* strategy in the agricultural sector. The expansion of the soy complex has also halted the agrarian reform, or 'agrarian revolution', which was an important part of Evo Morales' political agenda when he came to power in 2006. In the proceeding sections, Bolivia's soy complex is analyzed in terms of the four interlinked features of agrarian extractivism.

3 Agrarian Extractivism in Bolivia

Large volumes of materials extracted destined for export with little or no processing

The first dimension of agrarian extractivism as defined here concerns the volume of raw materials extracted and destined for export with little or no processing. Volumes are considered large relative to other agricultural-based exports and include the cumulative production of smaller-scale units. Processing is only significant if it generates value-added sectoral linkages and employment opportunities. As shown in Figure 1, soybean production area under cultivation has dramatically increased over the past ten years, with the volume extracted going from 836,700 metric tons (MT) in 2007 to 2,106,600 MT in 2014 while land area more than doubled from 428,000 ha to 935,000 during the same period (ANAPO, 2015)[5]. In 2013, 2,357,866 MT of soybeans and derivatives were destined for export, representing 90 per cent of total production (ANAPO, 2015; IBCE, 2015).

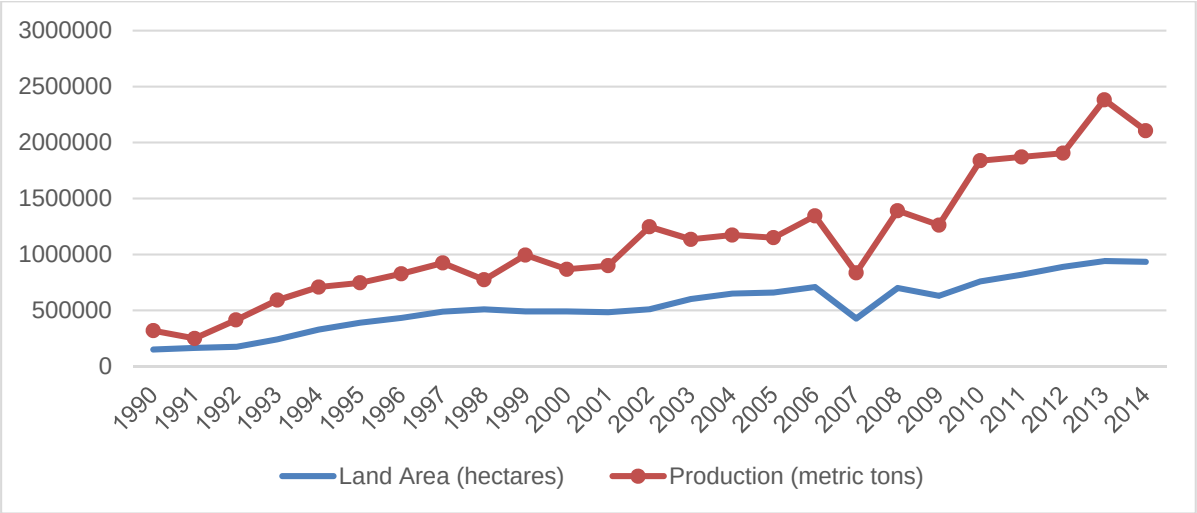

Figure 1: Total area and production, soybeans, summer harvest

Source: Data compiled by author from (ANAPO, 2015)

In terms of processing, the majority of Bolivia's soybeans are semi-processed as oilcake (57 per cent) and flour and meal (26 per cent). The importance of in-country processing is the value-added component of the production process which can trigger sectoral articulation as complementary sectors engage in industrial processing and manufacturing creating employment through inter-sectoral linkages. However, when soybeans are semi-processed into oilcake and meal for export there is no sectoral articulation and little employment generation. The oilcake must be further processed to be converted into animal feed or consumer products. Relative to Bolivia's agricultural productive capacity, soybean production is significantly high, occupying by far the most area under cultivation and generating more export revenues than any other crop. The high volume of soybeans produced,

[5] Data based on summer harvest only.

semi-processed and destined for export represent the first of four features of agrarian extractivism in Bolivia.

Value-chain concentration and sectoral disarticulation

The second dimension of agrarian extractivism in Bolivia pertains to the concentration of value-chain control and the lack of sectoral articulation. This section analyzes the components of the value-chain which make up the soy complex and whether or not such components are linked to other sectors of the economy which could trigger dynamic value-added linkages. Control over each component of the value-chain is indicative of surplus value appropriation in the soy complex. Sectoral disarticulation refers to the lack of forward and backward linkages (downstream and upstream) with other sectors of the economy which complement soybean production and agricultural industrialization. This is in reference to the production of GM seeds, agro-chemicals, agricultural machinery, processing, packaging, and consumer goods. These components of the soy complex are not produced in Bolivia, meaning their associated surplus value is appropriated elsewhere. Surplus value is produced during the production of these use values, which are imported to Bolivia in order to increase labour productivity and ultimately extract more value from soybean production. Bolivian soil and its natural fertility is a source of use value in the production process which, through the application of labour power and other agro-industrial inputs, produce surplus value represented by the soybean, an agro-commodity exchanged on international markets. Agro-industrial inputs and mechanization have substantially decreased the socially-necessary labour time to produce soybeans, reducing the need for labourers and extracting more of nature's use values through intensification, thus increasing the relative surplus value appropriated by agro-industrialists and capitalist producers. Moreover, the soil and its natural fertility vary across geographical areas, enabling those who control more favourable soils to appropriate more surplus profit (Marx, 1981). The soil's natural fertility increases the productivity of labour and enables the appropriation of surplus profits either by the capitalist producer or by those controlling the land in the form of ground rent (differential rent I) (Marx, 1981). Furthermore, different capitals (seeds, agro-chemicals, machinery) can also produce more value (at least temporarily, due to decreasing soil fertility) on equal amounts of land using the same amount of labour power. This is the appeal of technological innovation in agriculture, such as high yielding seed varieties, agro-chemical inputs and advanced mechanization. This is another form of surplus profit extracted from nature (as a use value) which may be appropriated as surplus value by capitalist producers or as ground rent (differential rent II) by landowners (Fine & Saad Filho, 2004). In other words, ground rent is the appropriation of surplus profits by landed property. However, in Bolivia's soy complex, ground rent does not predominate, rather capitalist producers and agro-industry appropriate surplus profits derived from nature's variable use values.

The most central part of the production of soybeans, which is the basis for the entire complex, is land. Control over the land means control over the element of production where the soybean (and surplus value) is produced. The soil and the worker, as Marx put it, are "the original sources of all wealth" (Marx, 1976, p. 638). Land serves as both the means of production, by providing nutrients for the soybeans to grow, and embodies part of the production process within the soil itself (Harvey, 2006, p. 334). Of course, other necessary inputs, including labour power, seeds and machinery are required, but land remains central. Yet, formal land *ownership* has become less and less important in appropriating the surplus value from the production process. This is due to the new mechanisms of control which have emerged from capital-intensive forms of agricultural production. What we can observe in Bolivia is that many of those who have property rights do not have access to the necessary capital to put their land into production and therefore lack the ability to sufficiently benefit from their land[6]. These exclusionary dynamics are referred to as 'productive exclusion' and are elaborated further below.

Despite attempts at agrarian reform in 1996 to Evo Morales' 'agrarian revolution' launched in 2006, the landholding structure in Santa Cruz remains highly concentrated by a politically and economically

[6] See Ribot and Peluso's Theory of Access (2003).

influential class of landed elites and agro-industrialists. Among soy producers in Santa Cruz, large-scale landowners with 1000 hectares or more represent just 2 per cent of total farm units yet own over 70 per cent of land (IBCE, 2014). Small-scale landowners with less than 50 hectares represent nearly 80 per cent of total farm units, yet own less than 10 per cent of the land. However, discourses from agro-industry and the state justify these inequalities by claiming that nearly 80 per cent of soybean farmers are small-scale, thus providing employment and food security for the Bolivian population. This claim, however, is extremely misleading since there are, on average, just 22 tractors and 4 harvesters for every 100 agricultural units in Santa Cruz and the largest units (over 1000 ha) often have several tractors and harvesters working their parcels (INE, 2015). Since soybean production has become 'industrialized', meaning the widespread (nearly 100 per cent) use of genetically-modified seeds, agro-chemical inputs and heavy machinery, only an estimated 5 to 20 per cent of farmers are actually working the land increasing economic and land-based inequalities (INE, 2015; field notes 2014-15).

Figure 2 shows the main areas of agricultural expansion in Santa Cruz, with zones C and B being the main areas of soybean plantations and expansion. Most large-scale soybean plantations are located in zone B, while smallholders who mostly rent out their land to capitalized soybean farmers are located in zone C and along the border of zone A and B (see McKay and Colque, 2016).

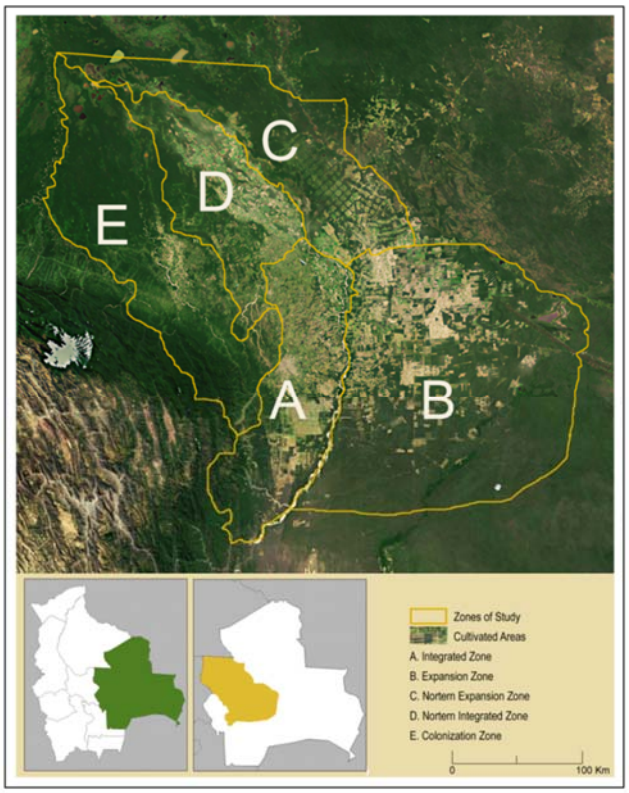

Figure 2: **Map of agricultural expansion zones, Santa Cruz**

Source: (McKay & Colque, 2016)

Though the majority of farm units are 'small-scale', those farmers are increasingly excluded from production, forfeiting the majority of surplus value production to capital-rich farmers. This is referred to as the 'partida' arrangement whereby smallholders lease their land to capitalized producers and receive between 18-25 per cent of the harvest after production costs (field notes, 2014-15). Capitalized farmers therefore appropriate 75 per cent of the surplus value produced from the lands of smallholders, while also appropriating 100 per cent of the surplus value on their own lands. During the soybean price 'boom' years from 2008 to 2014, we can estimate that for every metric ton of soybeans produced on land owned by smallholders, approximately USD $27 was appropriated by small-scale landowners

and USD $80 by the capitalized farmer working the land in a 'partida' arrangement given yields of 2 MT/hectare.[7]

However, surplus value appropriation via land control is only one part of a much larger soy complex. Soybean storage and processing facilities also appropriate value through processing soybean grain into meal and oil, as well as their access to export markets. Six companies control roughly 95 per cent of Bolivia's soybean market, giving them great influence over prices and quality standards. These six companies appropriate the majority of the surplus value generated from Bolivia's soy complex.

***Table 1*: Market share of Bolivia's soy (+derivatives) export market**

Company	Origin of Capital	Principal export markets	Percentage of market share	Revenue Ranking 2013	Rank and contribution to total national tax revenue
Gravetal Bolivia S.A.	Venezuela	Venezuela, Colombia, Peru, Ecuador	31%	16th	77th (0.1%)
Industrias de Aceite S.A. (FINO)	Peru	Colombia, Peru, Chile	22%	9th	38th (0.2%)
ADM SAO S.A.	USA	Colombia, Peru, Chile, Ecuador	13%	11th	41st (0.2%)
Cargill Bolivia S.A.	USA	Colombia, Peru, Chile, Ecuador, Spain	11%	48th	Not ranked (n.r.)
Industrias Oleaginosas S.A. (RICO)	Bolivia	Colombia, Peru, Chile	9%	28th	n.r.
Compania Boliviana de Granos S.R.L.	Bolivia	Peru	9%	34th	n.r.

Sources: Data compiled by author from (AEMP, 2013; IBCE, 2014; Impuestos Nacionales, 2014; Nueva Economía, 2015)

Just two of the six companies who control 95 per cent of Bolivia's soybean processing and export market are owned and operated by Bolivian capital (Granos, 9 per cent; Rico, 9 per cent), while only two companies (Rico and FINO) produce value-added consumer products derived from soybeans. FINO, for example, takes advantage of the crops multiple and flexible uses, producing cooking oils (FINO), margarine butter (Regia and Primor), shortening (Karina and Gordito), and soaps and detergent (Uno, Azo, Oso). However, such value-added final consumer goods account for less than 10 per cent of total soybean production.

[7] Author's own calculation based on data collected in zones B and C from 303 households.

For processors, it is possible to calculate the 'crush' value of the soybean industry. The soybean crush is the process of converting soybeans into soybean meal and soybean oil and the relationship between their prices is called the Gross Processing Margin (GPM) (CBOT, 2006). The crush spread, or GPM, is a measurement of the profit margin for soybean processors. While many factors affect the soybean crush spread, according to a report by the Chicago Board of Trade, "soybean prices are typically lowest at harvest and trend higher during the year as storage, interest, and insurance costs accumulate over time" (CBOT, 2006, p. 1). Evidently, this means that producers receive the lowest price for the oilseed grain at harvest, and agribusiness companies who store, process and trade the crop appropriate more value as the price increases along the chain. Soybeans are crushed into meal (73.3%), oil (18.3%), hulls (6.7%) and waste (1.7%). To calculate the GPM or soybean crush, we use a common denominator of US dollar per metric ton and use the following equation:

$$GPM = (Price\ of\ soybean\ meal\ (\$403.28)\ \times\ 73.3\%) + (Price\ of\ soybean\ oil\ (\$669.86)\ \times\ 18.3\%) - Price\ of\ soybeans(\$390.40)$$

Based on prices from the Chicago Board of Trade, the soybean crush spread for July 2016 is USD $28.15/MT. This means that for every metric ton of soybean produced in Bolivia, agro-industry appropriates USD $28.15, given the soybean crush spread for July 2016. In the summer harvest of 2014-15, Bolivia produced 2,106,600 MT of soybeans (ANAPO, 2015). Assuming a GPM of USD $28.15, agro-industries in Bolivia would have received USD $59,300,790 for that harvest alone. As shown in Table 1, despite a high revenue ranking, these agro-industries contribute very little to national tax revenue, while the lack of sectoral linkages and value-added suggest very little of this surplus value is re-invested back into the Bolivian economy.

Furthermore, the three main upstream components – seeds, agro-chemicals, and machinery – are neither produced within Bolivia nor are they articulated with other sectors. Rather, they are imported as finished industrial/consumer goods and are used to circulate through Bolivia's soil to produce a soybean which is semi-processed, controlled by an oligopoly and exported for further value-added processes elsewhere to produce animal feed and biodiesel for external markets. The trade-off is not more employment or value-added industrialization, but rather an increased dependence on volatile international food prices due to land use change and the exclusion of small farmers from working the land. Since the legalization of genetically modified soybean seeds in 2005, seed imports have increased from 354 metric tons (MT) in 2005 to 9862 MT in 2012, while the price per MT has nearly doubled from $USD 404 to $USD 738/MT (AEMP, 2013; INIAF, 2015). Further, nearly 100 per cent of seed imports originate from Argentina, produced by the major agribusiness companies Monsanto and Syngenta while just four companies control Bolivia's soybean seed import market (INIAF, 2015; McKay, 2015). The agro-chemicals used to complement the glyphosate-resistant seeds have increased some 204 per cent while the area under soybean cultivation increased just 28 per cent during the same period (2010-2014) indicating a significant increase in agro-chemical application per unit of cultivation (ANAPO, 2015; SENASAG, 2014). These chemicals are also imported, with China representing the majority of imports (48 per cent) followed by Argentina (22 per cent), Brazil (7 per cent), and Paraguay (7 per cent) (SENASAG, 2014). Agricultural machinery – tractors, fumigators, and harvesters – which have replaced manual labour and changed the entire production process with substantial productivity increases are also imported, principally from Brazil (61 per cent), United States (10 per cent) and Argentina (9 per cent) (INE, 2016). Bolivia's soy complex can thus be characterized by the importation of finished products (GM seeds, agro-chemicals, machinery), the circulation of this agro-capital through Bolivian soil controlled by a small minority of agro-capitalist, a concentration of control of the production process by a few companies, and the export of the semi-processed product. The extraction of the surplus value from the production process and appropriated by a few domestic and multinational companies (value-chain concentration) and the lack of forward and backward linkages in the domestic economy (sectoral disarticulation) represents a significant dimension of agrarian extractivism in Bolivia.

High intensity of environmental degradation

The third dimension of agrarian extractivism in Bolivia concerns the intensity of environmental degradation in the region. This refers to unsustainable farming practices which have lasting effects most directly on the communities in close proximity to the production process, but also beyond. Highly-mechanized and genetically-modified (GM) soybean production is based on a myriad of unsustainable farming and land use practices associated with declining soil fertility and erosion, contamination of water sources, high rates of deforestation, and the loss of biodiversity which contribute to climatic changes such as increased flooding and drought (Hecht, 2005; Müller, Larrea-Alcázar, Cuéllar, & Espinoza, 2014; Pengue, 2005). This is linked to the heavy use of synthetic fertilizers and agro-chemicals required to treat large-scale monocultures, the mechanization of production, and the massive expansion of the agricultural frontier to serve export markets principally for animal feed and biodiesel (Catacora-Vargas et al., 2012). This section focuses on the intensity of environmental degradation faced by rural communities in Santa Cruz with first-hand accounts from smallholders in the region.

Since the legalization of GM seeds, the quantity of agro-chemicals used in production has far outpaced the cultivation area. Soybean farmers in the expansion zone attest to this, explaining that year after year new types of weeds and pests threaten their crops and require new types of herbicides and pesticides. Personal interviews with farmers in 2014 and 2015 revealed that the majority of small-scale farmers with less than 50 hectares average close to 2 MT/hectare of soybean harvest while those medium and large-scale farmers who possess machinery average closer 3 MT/hectare (field notes, personal interviews 2014;2015)[8]. The lack of machinery, inability to purchase top quality seed and agro-chemical packages, and land quality/location render capital-poor farmers less able to produce and compete, while suffering disproportionally both economically and socially from ecological degradation.

Prominent community leader Paulino Sánchez of Nuevo Palmar came to Cuatro Cañadas from Potosi in 1983, receiving 50 hectares from the government. He says that one of the more challenging issues for farmers today is the depletion of the soil's fertility. "The soil is losing its nutrients", he says, "there is compaction from machinery and people use a lot of chemicals, so yields are decreasing" (Sánchez, personal interview 2014). Over the past ten years, yields have fluctuated between 1.3 to 2.7 MT/ha which is difficult for farmers' economic security since for each hectare, one ton of harvest roughly covers the cost of production, he said. Those who can afford the best seeds and technologies, however, do not suffer the cost of this environmental degradation to the same extent, at least in the immediate term. Sánchez also explained that many people are worried about the risks of investing in production due to high costs and the frequent periods of drought and floods. Some people have lost everything due to natural disasters and therefore do not want to risk their entire savings on a tractor or harvester with so much uncertainty. These natural disasters, particularly the effects of El Niño and La Niña, are increasingly affecting not only farmers and their harvests but entire communities. Since 1990, there have been a total of 25 floods which have resulted in the death of 674 people and affected close to 3 million (EM-DAT, 2016). While the expansion of Bolivia's agricultural frontier and the resulting deforestation is certainly not the only cause of the increased frequency and severity of floods and drought, forests and forest loss greatly influence regional and global climates as they not only play an important role as a carbon sink but also return water to the atmosphere via the extraction of soil water by tree roots referred to as 'a transpiration service' (Malhi et al., 2008).

A United Nations (UN) study reveals that in the past 30 years, Bolivia has lost over six million hectares of forest and has one of the highest rates of deforestation per capita in the world (320 m^2/person/year) – 20 times higher than the global average (16m^2/person/year) (UN-REDD, 2010). Seventy-five percent of this deforestation activity is located in Santa Cruz, with an average

[8] Interviews were conducted in Cuatro Canadas and San Julian with 75 small, medium and large-scale soybean farmers in 2014 and 2015.

deforestation rate of 200,000 hectares per year from 2000 to 2010 (Cuéllar, Rodríguez, Arroyo, Espinoza, & Larrea, 2012).

A study by Müller et al. (2013) found that from 1992 to 2004, 72.6 per cent of the 1.88 million hectares of forests cleared in Bolivia's lowlands was due to medium and large-scale mechanized agriculture (53.7 per cent) and small-scale agriculture (18.9 per cent) with cattle ranching causing the remaining 27.4 per cent. This period coincides with the initial expansion of the agricultural frontier when soybean cultivated areas increased from 164,920 hectares in 1992 to 602,000 hectares in 2004 (ANAPO, 2015). In the late 1990s, for example, three Mennonite communities abandoned over 100,000 ha of soybean land due to soil erosion, compaction, and exhaustion as they moved north to clear new territory, selling their land to cattle ranchers (Fearnside, 2001). However, during the period from 2005 to 2010, Müller and others (2014) found that the principle drivers of deforestation in the lowlands had reversed, with cattle ranching representing 59.7 per cent and mechanized agriculture (24.6 per cent) and small-scale agriculture (15.9 per cent) representing a combined 41.3 per cent. As land prices increase and market conditions make growing soybeans more profitable than cattle ranching, agro-industry tends to push cattle ranchers to expand into new areas, triggering more deforestation and opening new areas for future soybean expansion (Fearnside, 2001; Hecht, 2005; Weis, 2013).

The dynamics of deforestation run much deeper than the loss of forests and biodiversity. Forests provide important land cover, prevent erosion, absorb rainfall and provide important ecosystem services that regulate weather and climate patterns. There is ample evidence that deforestation amplifies flood risk and exacerbates the severity of El Niño-Southern Oscillation (ENSO) climate cycles (Bradshaw, Sodhi, Peh, & Brook, 2007; Malhi et al., 2008). Rapid rates of deforestation have coincided with increased floods in Bolivia with the most catastrophic floods in recent history in 2007/2008 and 2014. In 2007 floods displaced over 100,000 families, killing 50 people and affecting 366,000 hectares of cultivated land; while in 2008 floods resulted in the deaths of another 67 people, displacing 97 families as the river, Rio Grande, which borders the principal soy producing communities of El Puente, San Julian, Cuatro Cañadas, and Pailon (bordering zones A and B in Figure 2) rose between 3 to 4.5 meters (BID, 2014). In 2014, 85 municipalities were affected, displacing some 24,036 families, destroying 713 homes, killing 44 people and affecting 352 hectares of cultivated land (BID, 2014, p. 8). In May 2015, over 100 communities in the municipality of San Julian alone lost much of their harvest due to floods. Abraham Guzman of Nucleo 20 in San Julián lost his entire parcel (45 hectares), while approximately 700 hectares in his community were flooded. For small farmers, this results in almost an entire year's income lost, while their initial investment in agro-inputs leads to indebtedness – sometimes to agro-industry such as ADM, Gravetal, Monica, FINO, etc., or to other farmers – which could potentially lead to having to sell their land. The ENSO phenomenon and floods continue to increase in intensity and frequency, as shown in the following figure:

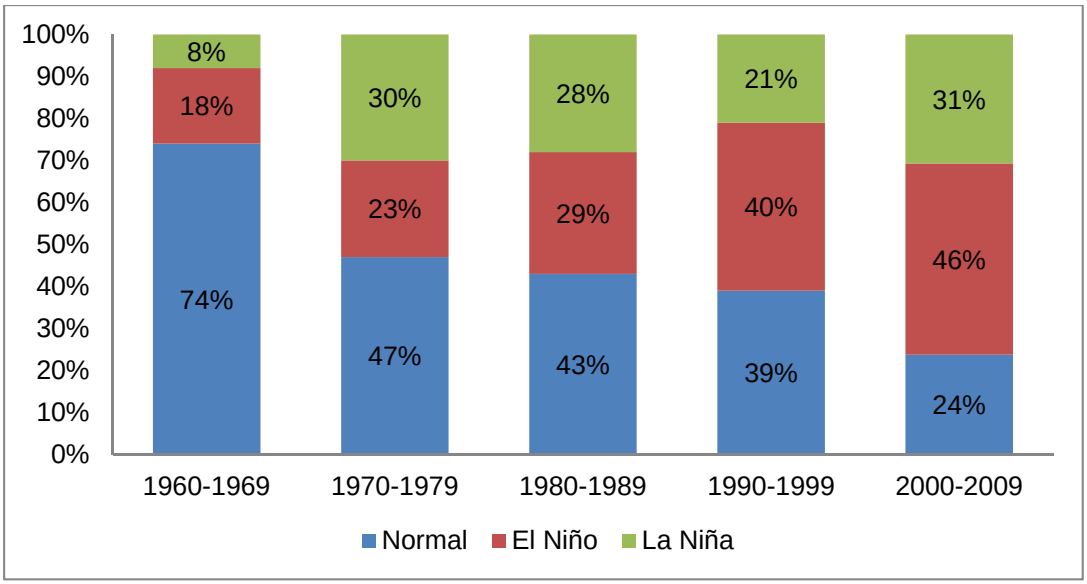

***Figure 3*: Degree of occurrence of the El Niño-Southern Oscillation (ENSO) climate phenomenon, Santa Cruz**

Source: (ACF-IN, 2009)

The increasing occurrences and severity of floods and drought do not affect everyone equally. In the soy expansion zone and especially in the municipalities of Cuatro Canadas and San Julian, the vast majority of small-scale farmers occupy plots of land in the flood zone around Rio Grande (along the line dividing zones A and B), a large river that borders these communities, while large-scale plots occupy the more fertile and slightly higher land to the east of Highway 9 (zone B).

Furthermore, a study by Mekonnen and Hoekstra (2011) of the Twente Water Centre in The Netherlands found that for every ton of soybeans harvested requires one ton of water. Taking into account the total amount of forest cover lost, the decline in soil fertility, loss of biodiversity, and water contamination points to a stark ecological deficit and potential for ecological crisis if this production model persists. The sheer amount of agro-chemicals used in the country – from 12.6 million kg/l in 2010 to 38.3 million kg/l in 2014 – is exhausting the soil and threatening the health and safety of communities (SENASAG, 2014). The ecological extraction taking place as a result of an expanding agro-industrial soy complex is apparent.

The capitalist penetration of agriculture and the appropriation of seeds, fertilizers, pest control, and even labour by industry has led to the "discontinuous but persistent undermining of discrete elements of the agricultural production process, their transformation into industrial activities, and their re-incorporation into agriculture as inputs" (Goodman et al., 1987, p. 2). This process, what Goodman, Sorj and Wilkinson (1987) call 'appropriationism' has provoked this irreparable rift in the socio-ecological metabolism. The substitution of natural for industrial inputs allows for the accelerated extraction of nature's value, overriding previous ecological constraints, while the technological packages of synthetic fertilizers, genetically-modified seeds, agro-chemicals, and mechanization similarly override traditional farmer knowledge, practice, and labour requirements rendering farmers increasingly dependent on and even obsolete to agro-industry. This separation and disregard for the socio-ecological metabolism, neglects natural processes of regeneration and the symbiosis of agro-ecological processes by rapid environmental degradation through externalizing costs and technological 'fixes'. Such biophysical override is unsustainable and its tendency to generate ecological crises and move into new greenfield sites exposes the accelerating contradictions of industrial capitalist agriculture (Weis, 2010). With nearly 90 per cent of Bolivia's soybeans and derivatives destined for export, the ecological value is not only extracted and appropriated for value realization elsewhere; the 'mode of extraction' diminishes the productive capacity of the natural resources in the long term

leading to ecological impoverishment and unequal ecological exchange between trading countries (Bunker, 1984; see Gudynas, 2015). As Bunker asserted in his important work on extractive export economies in the Amazon Basin and their tendency for unequal net flows of matter and energy exchanges with productive economies, "we must consider the effects of the exploitation of labor and the exploitation of the entire ecosystems as separate but complementary phenomena, both of which affect the development of particular regions" (1984, p. 1053). The extraction of the ecological value from the natural environment is a defining feature of agrarian extractivism in Bolivia. As Bunker wrote over 30 years ago, "the ecological and demographic consequences of these disruptions are likely to last far longer than the demand for the commodity or the particular mode of extraction which provides it" (1984, p. 1056). For Bolivia, the socio-economic and ecological impoverishment of its principal 'mode of extraction', mining, should serve as a stark reminder. The tragic underdevelopment and impoverishment of Bolivia's once largest and richest mining city of Potosi or the more recent disappearance of Bolivia's second largest lake, *Lago Poopó*, for which hundreds of families depend for their livelihood, exemplify the harsh realities of extractivism.

Deterioration of labour opportunities and/or conditions

The fourth dimension of agrarian extractivism in Bolivia concerns the lack of labour opportunities pertaining to the soy complex. From a labour perspective, there is nothing inherently undesirable with mechanized soybean production. To be sure, most people would much rather benefit from the increased labour productivity and less physically-demanding conditions of labour associated with mechanized agriculture. In other words, it is not mechanization as a form of agricultural production which is in and of itself a problem, but the social relations of production associated with the form within the broader socio-economic context. When the form of production substantially decreases the need for labour in a sectorally and socially disarticulated economy, it can result in surplus populations, whereby "labour is surplus *in relation to* its utility for capital" (Li, 2009, emphasis in original). This dimension of agrarian extractivism is not limited to the decreased need for wage labourers in the production process, but also deteriorating conditions for workers – in terms of health, safety, and precariousness. Manual sugarcane cutting in Brazil, for example, still provides a livelihood for some 500,000 people, but conditions are extremely demanding both mentally and physically, often akin to slave-like conditions (Alves, 2006; McGrath, 2013). Data from the Land Pastoral Commission (Comissão Pastoral da Terra, CPT) revealed that 10,010 workers were liberated from slave-like labour conditions in the sugarcane sector from 2003 to 2010 (Brasil, 2011). Furthermore, in reference to oil palm and sugarcane plantations in Guatemala, Alonso-Fradejas asserts that "while labor and labor arrangements are flexibly organized to maximize surplus extraction, the working conditions are damaging workers' physical and mental health in severe and even deadly ways (2015, p. 492). Both of these dimensions of labour are considered part of agrarian extractivism. In Bolivia's highly mechanized soy complex, it is labour's lack of utility for capital accumulation which is generating surplus populations.

Mechanized tractors, sowers, fumigators and harvesters have recently come to dominate production, largely over the past ten years, replacing manual labour production, traditional farming practices and more diversified farming. The rapid rise of soybean prices on international commodity price markets combined with the legalization of GM soybean seeds in 2005 and socio-economic and environmental pressures to 'modernize' agricultural production led to the nearly ubiquitous use of GM seeds and monocrop production systems. Small-scale farmers who previously depended on traditional, labour-intensive production became increasingly integrated within the soy complex through the purchase of technological packages and dependence on heavy machinery for production. Yet, while this technological innovation has spurred productivity it has excluded the majority of the rural population from the production process itself, generated unsafe working conditions and led to widespread environmental degradation and destruction.

A study by Philip Fearnside of the National Institute for Research in the Amazon, suggests that soybean plantations in Brazil displace 11 agricultural workers for every one it employs (2001). In Bolivia, similar dynamics of labour are observed. Prior to mechanization, it would take approximately

10 labourers to work one hectare of land per day. With mechanization, one person can sow 50 hectares in 15 to 16 hours, fumigate in 5 hours, and harvest in 2 or 3 days (field note, 2014-15). Labour requirements have decreased drastically as a few people can now work several hundred hectares in a much shorter period of time. The downfall to this technological innovation is the lack of available labour opportunities and the exclusion of the majority of the rural population. If this type of 'creative destruction' offered new employment opportunities through new types of value-added industrial development, the excluded populations could be absorbed elsewhere. However, what we observe in Bolivia is a lack of labour opportunities in the countryside with no clear pathway or opportunities in urban centers.

The penetration of new agro-capital in the form of new biotechnologies and machinery has excluded farmers from working their land – a process referred to as 'productive exclusion' (McKay & Colque, 2016). While labour productivity increases, the majority of farmers are excluded from accessing the necessary factors to put land into production due to their inability to access capital and credit. The soy complex has rendered farming "technical" and virtually removed traditional farmer knowledge from the process, as farmers now rely on agro-industry for their knowledge of chemical and seed quantities, as well as sowing and harvesting periods. Many have transitioned into semi-proletarian and petty bourgeois rentiers, renting their land to medium and large-scale farmers, or entering into debt relations through contract farming schemes. Instead of working the land, they collect rent and work as taxi drivers, shopkeepers, bus drivers, roadside and construction workers (McKay & Colque, 2016, p. 603). Employment that has been created as a result of the soy complex has tended to be precarious, seasonal, contractual, and uncertain. Opportunities such as transportation during harvest, maintenance and cleaning of silos, roadside bush clearing, etc., offer some employment but are very temporary, sporadic and under flexible arrangements.

Aside from the exclusiveness, precariousness and lack of employment generated by the soy complex, the nature of working with and consuming the agro-chemicals associated with GM seeds is also highly dangerous for public health. Many farmers are exposed to the chemical substances during mixing, spraying, cleaning and disposing of containers (field notes, 2014). Long term exposure and ingestion of these chemical substances are highly dangerous and should be handled with safety equipment (including gloves, proper mixing equipment, dust masks, goggles) which is extremely rare in the two central communities in Santa Cruz's soy expansion zone, Cuatro Canadas and San Julian. The main agro-chemicals used in Bolivia are glyphosate, 2,4-D, Atrazine and Paraquat – all of which are highly controversial due to their high levels of toxicity and association with neurological and reproductive disorders (Catacora-Vargas et al., 2012)(. Paraquat, for example, has been linked to Parkinson's Disease (Kamel, 2013; Tanner et al., 2011)(, while Atrazine to reproductive disorders (Hayes et al., 2011; Tillitt, Papoulias, Whyte, & Richter, 2010). Glyphosate, the active ingredient in Monsanto's Roundup Ready herbicide was recently evaluated by the World Health Organization's International Agency for Research on Cancer (IARC), which found that the most heavily used chemical in the soybean sector is classified as "probably carcinogenic to humans" meaning that there is "sufficient evidence of carcinogenicity in experimental animals" and a positive association between exposure to the agent and cancer in humans, but other explanations cannot be completely ruled out (Guyton et al., 2015; IARC, 2015). Atrazine and Paraquat have been banned in the European Union, while glyphosate has been banned in a few countries but remains controversially legal in the EU. Data from the Ministry of Health reveals that the incidence of agro-chemical poisoning in Santa Cruz has increased from 183 cases in 2010 to 475 in 2015 which an average of almost one per day over the past five years (Ministerio de Salud, personal communication, 2016). Health workers and hospital staff in Cuatro Canadas and San Julian contend that common health problems which are increasing in the community and are associated with the use of agro-chemicals include skin disease, gastrointestinal disorders, and neurological problems (dizziness, headaches). While farmers themselves have expressed their concerns over newly developed health problems (skin irritation, headaches), the long terms effects and broader health impacts for the community at large are still unknown (field notes, 2014-15).

The extractive nature of Bolivia's soy complex is reducing labour opportunities and conditions. The lack of forward and backward linkages produced within Bolivia to create value-added productive

opportunities limits employment associated with the soy complex. Instead, processes of 'productive exclusion', surplus populations, and health threats for producers and consumers characterize the labour conditions of the soy complex, signalling a potential widespread rural-urban migration in the medium to long term.

4 Conclusion

This paper has attempted to delve deeper into the very extractivist dynamics of Bolivia's soy complex through analyzing four interlinked dimensions of agrarian extractivism: (1) large volumes of materials extracted destined for export with little or no processing; (2) value-chain concentration and sectoral disarticulation (3) high intensity of environmental degradation; and (4) deterioration of labour opportunities and/or labour conditions. It is argued that agricultural activity which involves these four interlinked dimensions is better characterized as agrarian extractivism, rather than industrial agriculture due to the very social, economic, and environmental extractive dynamics. Extractivism has predominantly been used to characterize mining and hydrocarbons, though more recently it has come to characterize certain forms and modes of agricultural production in the context of the wave of literature on neo-extractivism. This paper contributes to these analyses, particularly those put forth by Gudynas (2015), Acosta (2013), Alonso-Fradejas (2015), Veltmeyer and Petras (2014), and Svampa (2013) in order to further develop the concept of agrarian extractivism and challenge dominant discourses which characterize present-day forms of capitalist agriculture as *industrial* agricultural development. Dominant forms of agricultural expansion which extract large volumes of raw materials with little to no processing, lack sectoral linkages and remain controlled by a market oligopoly, contribute to widespread environmental degradation and destruction, and deteriorate labour opportunities and/or conditions are not leading to any kind of industrial development, nor contributing to inclusive rural development. As put forth by Gudynas, corporations and governments have adopted the term 'industry' to defend extractivism – as a form of legitimacy – though the continued socio-economic and environmental exploitation suggests otherwise (2013:2). In Bolivia extractivism is defended on the basis of resource nationalism (Pellegrini, 2016), to counter 'green imperialism' (see Fuentes, 2011) and even as a means to guarantee food sovereignty (see Vicepresidencia 2012). These legitimating discourses have become part of a broader neo-extractivist development model.

Agrarian extractivism is not a synonym for industrial capitalist agriculture. We need to go beyond the debates of large versus small scale and GMOs versus agroecology to a more encompassing framework of agrarian extractivism to reveal the social, economic and environmental implications of various forms and modes of agricultural activity. This paper hopes to contribute to this framework by analyzing the extractive dynamics of Bolivia's soy complex and challenging discourses of agricultural industrialization and rural development.

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