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Abstract	<p>The chapter offers a much-needed sociotechnical analysis of the bioeconomy as a concept and a political project in Argentina. Focusing on the case study of genetically modified (GM) soy, Delvenne shows that the bioeconomy is at the center of intense struggles to re-think agriculture as-we-knew-it, and to re-name it as "agro-industry". The chapter explores these developments as evidence of an attempt to reject the idea of agriculture as the reactionary stronghold of a backward bourgeoisie and instead embrace agriculture as generative of an industrial avant-garde that promises political-economic transcendence. The chapter closes with an investigation of new forms of 'networked agribusiness' that constitute the habitat of today's bioeconomy in Argentina.</p>	



CHAPTER 10

Embedded Promissory Futures: The Rise of Networked Agribusiness in Argentina's Bioeconomy

Pierre Delvenne

“The bioeconomy is one of the things that in principle everyone agrees on” (personal Interview with a public official from the Science, Technology and Productive Innovation Ministry).

INTRODUCTION

In Argentina, as elsewhere, policy discourse on “the bioeconomy” addresses an abstraction as if it had a concrete existence. The policy plan *Bioeconomía Argentina 2016* states: “Argentina has features that offer multiple opportunities for the development of the local bioeconomy. The country has a vast territory, large variety of climates and biodiversity, an important area of native and planted forests, and highly competitive agricultural and livestock and agribusiness sectors”.¹

As argued in this book, the concept of the bioeconomy is an act of political imagination. According to Goven and Pavone (2015: 6), “[i]t is

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19 a promissory construct that is meant to induce and facilitate some actions
20 while deterring others; most explicitly, it is meant to bring about a par-
21 ticular set of changes that will shape the parameters of possible future
22 action.” Argentinean policymakers today instrumentally use the concept
23 to try to re-territorialize economic activities by promoting regional/pro-
24 vincial bioeconomies (emphasizing the plural) and, more importantly, to
25 conclusively transcend a historically entrenched dichotomy between agri-
26 culture and industry.

27 Recent institutional embodiments of these political attempts can
28 be observed, for instance, with the creation of a Secretary of State for
29 Bioeconomy (rebranded in late 2015 as a “Secretary of State for Added
30 Value”) and its institutional lodging within the Ministry of Agroindustry
31 (formerly “Ministry of Agriculture, Cattle Raising and Fishing”) in the
32 aftermath of the most recent presidential elections. Mauricio Macri,
33 the newly elected President, stressed in his first speech that a key chal-
34 lenge of his administration was to “achieve the agroindustrialization of
35 Argentina”. This is probably where the political value of the bioecon-
36 omy concept lies: it is an attempt at definitively crossing a formerly set-
37 tled boundary between agriculture and industry. As a political project,
38 bioeconomy appears as the latest stage of a co-production process at the
39 intersection of the political and technoscientific levels. At the techno-
40 scientific level, the global adoption of technological packages (biotech-
41 nologies + herbicides + new farming practices) started long before the
42 emergence of the bioeconomy concept and provided a hospitable ground
43 for its successful integration into national discourses. At the politi-
44 cal level, the roots of the bioeconomy are to be found in the neoliberal
45 1980s but, interestingly, both progressive (so-called “anti-neoliberal”) and
46 conservative governments sit comfortably with the concept. Whereas
47 Argentinean politics usually is extremely polarized and antagonistic, poli-
48 cymakers from opposed sides of the political spectrum have tried to enact
49 a specific world with the help of similar bioeconomic narratives.

50 The success of the bioeconomy as a political project, however, lies
51 in the possibility for this world to fit the collective capacities of imagi-
52 nation, which are deeply entrenched in the past. Effectively, the inter-
53 actions between emerging imaginative capacities and already existing
54 collective imaginations enable and constrain what actions will be possible
55 in the future. When a new master narrative such as the bioeconomy cir-
56 culates and embeds itself in specific countries (Delvenne and Hendrickx
57 2013), it sediments on previously existing histories, path dependencies



58 and technological trajectories that constitute the strata of knowledge/
59 social orders as they have unfolded up to the present day. In this chapter,
60 I use the “idiom of co-production” (Jasanoff 2004) to track and discuss
61 the regularities of this sedimentation process from the 1970s onwards, as
62 well as the tensions that arose when disruptive events affected the normal
63 course of sedimentation, and past social fractures and conflicts resurfaced.
64 The idiom of co-production, briefly stated, “is shorthand for the propo-
65 sition that the ways in which we know and represent the world (both
66 nature and society) are inseparable from the ways in which we choose
67 to live in it” (Jasanoff 2004). A co-production framework stresses the
68 importance of contextualization to make sense of the emergence and
69 stabilization of new technoscientific objects or the resolution of scien-
70 tific and technological controversies (Bonneuil et al. 2014). Importantly
71 for this chapter, co-production opens up “the possibility of seeing cer-
72 tain ‘hegemonic’ forces, not as given but as the (co-)products of contin-
73 gent interactions and practices. These insights may, in turn, open up new
74 opportunities for explanation, critique and social action” (Jasanoff 2004).

75 Whereas many authors have undertaken co-productionist analyses
76 mainly focusing on certain epistemic claims (e.g. scientific) and certain
77 social formations (e.g. the state), this chapter additionally makes use of
78 it to analyze the development of a political economy as both epistemic
79 and social order (Rajan 2012; Jasanoff 2012; Birch 2016). Inspired by
80 Joly (2015), I undertake a “strong co-productionist analysis”, meaning
81 that I pay attention to the diversity of processes that operate at different
82 scales (from local socio-technical arrangements to system level) and to
83 their interactions. A strong co-productionist approach “considers power
84 as relational and it is attentive to lasting asymmetries of power, the use of
85 force, constraint, ‘fait accompli’, and the accumulation of resources and
86 competences by some actors at the expense of others” (ibid).

87 This chapter analyzes the “bioeconomy” of genetically modified soy
88 in Argentina, the world’s third leading producer and exporter of GM
89 crops. GM soy production is a central source of extraction of economic
90 value, which has provided the economic oxygen to the country since it
91 declared a partial default on its national debt in 2001. As of 2014, soy
92 sector exports represented 28% of total Argentine exports and accounted
93 for USD 20 billion in foreign income (INDEC 2015).

94 The chapter is based on fieldwork carried out between 2010 and 2016,
95 as well as secondary sources (press articles, regulatory and legal docu-
96 ments). Fieldwork included 62 semi-structured interviews (8 in 2010,



97 31 in 2011 and 6 in 2015, 17 in 2016) carried out with individuals in
98 Buenos Aires and Rosario who are involved in the GM soy complex or
99 who have had a say in the public discussion around it (including members
100 of academia, public administration, seed and agrochemical companies,
101 agricultural production, regulation, distribution sectors, financial invest-
102 tors, managers of sowing pools, and related civil society organizations).
103 Some of the key informants were interviewed up to three times, and the
104 interviews were systematically analyzed, categorized and tagged with the
105 qualitative software Mosaiqs.

106 The text is structured as follows. It begins with a discussion of the
107 international and domestic political economy of Argentina during the
108 past 30 years, to stress the co-production dynamics of the GM soy model
109 with its political-economic contexts (neoliberal in the 1990s and national-
110 populist in the 2000s/2010s). The next section focuses on the techno-
111 scientific level, in particular how the adoption of a technological package
112 (biotechnology + herbicide + new farming techniques) has created an
113 opportunity structure supporting the emergence of a vanguard vision
114 aimed at “revolutionizing” agriculture. Following that, I analyze a par-
115 ticularly consequential development within Argentina’s GM soy bioecon-
116 omy: “*poles de siembra*” (sowing pools), the name given to an agricultural
117 production system characterized by the organization of a financial enter-
118 prise system that assumes temporary control of agricultural production.

119 THE POLITICAL ECONOMY OF GENETICALLY MODIFIED SOY

120 In the 1970s, Argentina went through a series of transformations
121 toward a new regime of capitalist accumulation. On March 24, 1976,
122 a military coup brought to power a violent dictatorship that, until the
123 recovery of democracy in 1983, devastated the country economically,
124 politically and socially (Giarracca and Teubal 2004; Hernandez 2013).
125 Contrary to what happened at the same period in neighboring coun-
126 tries, especially Brazil, where the dictatorship was supportive of indus-
127 try, Argentina went through a time of deindustrialization and openings
128 of its economy to financial liberalization. The “authoritarian bureaucratic
129 state” (O’Donnell 1979) implemented a series of measures that pro-
130 foundly affected the labor, agricultural, capital, and financial markets.
131 Wage increases were frozen in the public sector and the dictatorship
132 adopted provisions favoring large companies and financial and specula-
133 tive activities. Consequently, the external debt dramatically increased



134 and constituted a severe drag on policies and strategies of subsequent
135 democratic governments. Total external debt increased by almost USD
136 36 billion between 1976 and 1983, the year of the democratic recovery
137 (Teubal and Teubal 2011: 63). At the end of the 1980s, when the gov-
138 ernment temporarily suspended debt repayment, there was a massive and
139 generalized capital flight, which accelerated the devaluation of the cur-
140 rency, led President Alfonsín to resign and provoked the hyper-inflation-
141 ary outbreak period of 1989–1991. These conditions set the scene for
142 the profound process of neoliberalization during the administrations of
143 President Carlos Menem (1989–1995 and 1995–1999).

144 The agricultural sector was at the forefront of this neoliberalization
145 process: production was re-oriented towards export markets; the institu-
146 tions and mechanisms that regulated production for the internal market
147 were eliminated; and global agribusiness corporations expanded their
148 operations (Lapegna 2016: 6). In the early 1990s, the structural adjust-
149 ment plan carried out by the first Menem government deregulated the
150 markets for goods and capital, enacted the Convertibility Law, which
151 pegged the value of the peso to that of the US dollar (Giarracca and
152 Teubal 2004), and privatized public assets. These macroeconomic con-
153 ditions stimulated the free movement of financial capital and, in return,
154 undermined the little competitiveness that remained in the Argentine
155 industrial sector. The concentration of land and capital in agriculture
156 was facilitated by the enactment in 1992 of Law No. 24083 of mutual
157 fund investments, under which the organization of sowing pools was
158 designed, in order to turn agribusiness into a privileged niche for quick
159 returns on financial capital investments (Hernandez 2013).

160 The neoliberal agrarian restructuring accelerated in the second half of
161 the 1990s. The national government approved the commercialization of
162 herbicide-tolerant GM soy in 1996, and the biotechnology regulatory
163 regime was transformed on the basis of market principles benefiting large
164 corporations (Otero 2012; Delvenne et al. 2013). Combined with new
165 agricultural techniques well adapted to Argentinean conditions, particu-
166 larly no-till farming, glyphosate-tolerant soy has been by far the most
167 rapid adoption of any seed variety in Argentina, including those intro-
168 duced in the Green Revolution (Penna and Lema 2003). Consequently,
169 soy has replaced beef and wheat (the primary goods consumed by the
170 urban working class) as the country's leading export.

171 As Gras and Hernandez (2014: 343) explain, “a key explana-
172 tory element of the fast adoption of GM soy was the local economic



173 environment of the mid-1990s, which was shaped by a combination of
174 volatile international commodity prices and the impact of Argentina's
175 neoliberal economic policies on farmers". These impacts on the agricul-
176 tural sector were indeed significant: Menem's government reduced farm
177 subsidies and trade protections, and increased interest rates on agricul-
178 tural loans. In these conditions, for many indebted farmers the only way
179 forward was to embrace the new biotechnological wave:

180 You have a problem of technological shock in the mid-90s. You have a
181 problem of variation in international prices and profitability; farmers were
182 indebted and the only way out was an upgrade to biotechnology and the
183 new technological package, whereby at the end of the 2000s, you had
184 24–25 million cultivated hectares and 14 million mortgaged hectares. Yes,
185 Schumpeter is expensive... (Agricultural economist 1)

186 After 1997, the economy experienced a sharp decline and unemploy-
187 ment soared (Caceres 2015: 120), eventually leading to the 2001 crash,
188 when the neoliberal model of a decade of *Menemismo* collapsed and
189 forced Argentina to declare a partial default on its national debt (Teubal
190 and Teubal 2011). At that time, half of Argentines were living in poverty,
191 amongst the highest rates of inequality in history, with immense despair
192 in a context of institutional, political, and economic crisis (Leguizamon
193 2014: 155; Carranza 2005). Five different presidents succeeded each
194 other in less than 10 days during the 2001 crisis. The fifth of them was
195 Eduardo Duhalde, who decided to abandon convertibility with the USD,
196 to devalue the *peso*, and to call for a general election (Caceres 2015: 121).
197 The Peronist political party then came back to power: Néstor Kirchner
198 was elected president (2003–2007), to be followed by his wife Cristina
199 Fernández de Kirchner (2007–2011 and 2011–2015), what political
200 analysts called the "Kirchnerist" period. Kirchnerism was however not a
201 monolithic block. Argentinean political economist Mathias Kulfas (2016)
202 considers that the country has known three types of *kirchnerism*.

203 The first kirchnerism started with Néstor Kirchner's presidency, which
204 was a historical moment for soy export and profitability. During this time
205 there was a sustained international demand for soy products (notably from
206 emerging markets of China and India) coupled with a high price of com-
207 modities on global markets. Richardson (2009) coined the term "export-
208 oriented populism" to argue that under Néstor Kirchner's government,
209 changes in agricultural production (soy replacing wheat and meat as the



210 country's leading export) and productivity (which dramatically increased
211 as an effect of the adoption of the GM soy technological package, see next
212 section) created the conditions of a new variant of populism, temporarily
213 eliminating important sources of political and economic instability that
214 had plagued previous incarnations of Argentine populism. "Because soy
215 is not consumed by the working class, Kirchner could both promote and
216 tax their export, generating fiscal revenue for populist programs while not
217 harming the effective purchasing power of urban workers or provoking
218 a balance-of-payments crisis" (Richardson 2009: 228). Export-oriented
219 populism even expanded under the second kirchnerism, coinciding with
220 Cristina Fernández de Kirchner's first presidency (2007–2011),² as she
221 decided to increase the export taxes from 30 to 35%. "Increasing foreign
222 income from agricultural exports and higher fiscal revenue explain how it
223 was possible for the Kirchners to return to a model of state intervention,
224 investing in infrastructure and social spending, without enacting major
225 structural reform, thus keeping intact the agro-export model devised in
226 the neoliberal 1990s" (Leguizamón 2014: 156).

227 The Kirchners thus conserved and reinforced the transgenic soy
228 model they inherited. As Amalia Leguizamón explains:

229 [T]he rise of a self-proclaimed anti-neoliberal and progressive govern-
230 ment, the Kirchners', has in fact not dismantled the mode of production
231 set in place by the previous neoliberal administration. To the contrary, the
232 Kirchners' administrations have created favorable conditions for the expan-
233 sion of GM soy. Driven by debt, both neoliberal and post-neoliberal gov-
234 ernments have relied on state policy to intensify Argentina's comparative
235 advantage. (Leguizamón 2014: 158)

236 It is important to note that although state intervention is key to neo-
237 liberal policy, in most cases it is often so only in the supply side of the
238 economy. In a way, without dismantling the supply side, Nestor and
239 later Cristina Kirchner have been able to use part of the surplus to reac-
240 tivate, selectively, some demand-side oriented policies. However, this
241 strategy was severely challenged by a series of crises. The global finan-
242 cial crisis of 2008–2009 eventually eroded Argentinean growth rates;
243 a major drought in 2008 curtailed soy production; the slow erosion
244 of international prices of agricultural commodities reduced returns on
245 soy; and most importantly, in 2008 the countryside (the *campo*) rose
246 up against Cristina Kirchner's government, after she announced her



247 intention to increase the export tax on soy to 50%. Kirchner attempted
248 to do this through executive measure (“*Resolucion 125*”) to avoid hav-
249 ing it voted on by Parliament (see Fraga and Baistrocchi 2011). That
250 attempt failed and sparked a conflict that paralyzed the country for sev-
251 eral months: roads and bridges were blocked and there were massive
252 street demonstrations and public events against Cristina Kirchner. This
253 conflict disrupted the ideological patterns of classical Peronism, histori-
254 cally marked by a dichotomous view of the bourgeois agrarian country-
255 side (considered as the rich elite and the enemy of the Peronist cause)
256 and the industrial workers’ urban areas (considered as the poor people
257 to protect and emancipate from the elite’s domination). This was a real
258 turning point:

259 The powerful thing with the conflict with the ‘campo’ was that it joined
260 factions that were previously impossible to unite [...] It gathered all spec-
261 trums of the rural producers: from the peasant to the agribusiness, and
262 then many urban people who had never been supportive of the coun-
263 tryside; suddenly in this union we are all ‘el campo’, we are all with the
264 ‘campo’ against the government. (Environmental sociologist)

265 That conflict, and the related socio-economic and political struggles
266 that occurred in its aftermath, seriously plagued the third kirchnerism
267 (corresponding to the second mandate of Cristina Kirchner, 2011–2015),
268 which experienced a significant economic downturn: almost zero growth,
269 a sharp decrease in private investment, and a sustained drop in commodity
270 prices. It is in this light that we need to examine the successful emergence
271 of “the bioeconomy” as a concept and political project in Argentina.
272 Policymakers started to make explicit allusions to the bioeconomy from
273 2012 onwards, often explicitly referring to the OECD, the European
274 Commission, International Energy Agency and FAO’s definitions.

275 *Argentina Innovadora 2020* was designed in 2012 as a Science,
276 Technology and Innovation plan for the period 2012–2020. The Plan’s
277 objective was markedly similar to the Lisbon Agenda goal: “sustainable
278 development with social inclusion by improving the country’s economic
279 competitiveness”. The Ministry for Science, Technology and Productive
280 Innovation (MINCYT) focused its efforts on specific areas where the
281 country has or can have comparative and/or competitive advantages.
282 One of them, perhaps the most important one because of the relevance
283 of this sector for Argentina’s economic performance, is the agro-industry



284 sector (Martinez Demarco 2013). Interviewees share this relevance when
285 they address the bioeconomy today:

286 The issue of agro-industrialization is the main issue for us concerning the
287 bioeconomy. (Public official from the Science, Technology and Productive
288 Innovation Ministry)

289 For Kirchnerists, it was a way to accommodate to the moving political-
290 economic landscape of a post-2008 Argentina, which threatened both
291 the reelection of Cristina Kirchner and the legacy of one decade of recover-
292 ed Peronism. Thus, Kirchnerist policymakers realized that the inher-
293 ited historical dichotomies between agriculture and industry were falling
294 apart, and considered it necessary to move beyond the idea of agriculture
295 as a backward, elite rent-seeking sector.

296 Of course, agroindustry is the concept. I think there appears the value,
297 why it was so important for Argentina [...] I think in that sense the bio-
298 economy came to offer a smart way to rethink that and to go above and
299 beyond the conflict [between the government and the *campo*] and to
300 renew the agricultural sector that came to appear as a hub of innovation.
301 (Agricultural economist 2)

302 The issue is that we believed we had to get out of [the historical dilemma
303 between agriculture and industry] and that the word bioeconomy helped
304 us to raise the issue of agro-industrial development. So that also had
305 the virtue of putting value creation at the territorial level, bringing pro-
306 ducers closer to more stable markets, industrial contracts et cetera. [...] Bioeconomy helps retain the population, which is important because we have to somehow stop internal migration. (Public official from the Science and Innovation Ministry)

310 The bioeconomy concept proved to be of particularly high political
311 value because it allowed policy-makers to return to discussing previ-
312 ously existing issues (especially, the political construction of a boundary
313 between agriculture and industry) and to overcome the struggles over the
314 distribution of surplus in the aftermath of the 2008 conflict. Interestingly,
315 bioeconomy today is one of the few things that reconciles Kirchnerism
316 and Macrism. Both Peronist and conservative governments could indeed
317 endorse this vision of rural development as an advanced way to integrate
318 the territory and to seize the historic competitiveness of Argentina.



319 THE TECHNOSCIENTIFIC TRANSFORMATION OF AGRICULTURE

320 The durable transformation of agriculture and the joint progression
321 of ideas favoring the bioeconomy as a political project did not solely
322 happen as a consequence of political-economic measures taken “from
323 above”. Crucial developments also emerged “from below”, with farm-
324 ers’ grassroots activities as a crucial reservoir of power and action toward
325 a new vision of agriculture. In this section, I discuss the emergence of
326 that sociotechnical vanguard vision (Hilgartner 2015), and I show
327 how it became possible for one small group equipped with this van-
328 guard vision to shape the future of agriculture by mobilizing resources
329 and linking them up with their own technoscientific projects. Vanguard
330 visions emanate from “relatively small collectives that formulate and act
331 intentionally to realize particular sociotechnical visions of the future that
332 have yet to be accepted by wider collectives” (Hilgartner 2015: 34). In
333 doing so, these vanguard actors “typically assume a visionary role, per-
334 forming the identity of one who possesses superior knowledge of emerg-
335 ing technologies and aspires to realize their more desirable potential”
336 (Hilgartner 2015: 34).

337 At the end of the 1980s, a small group of farmers who were both
338 concerned by the environmental costs of their farming techniques and
339 seeking productivity gains initiated what was going to become a major
340 breakthrough in farming practices. These pioneers, who were inclined
341 to make alterations to their agricultural machinery to accommodate
342 desired changes in practice, started by replicating some machines they
343 had seen in Brazil in order to avoid tilling the soil. With the support of
344 technical advisors from Monsanto, they were encouraged to establish a
345 non-till farming association, AAPRESID, which was created in 1989.
346 AAPRESID members were concerned with articulating a new vision,
347 for which they “[took] action on the ground actually to prototype,
348 build and configure practices that should—literally—realize their ideas”
349 (Hilgartner 2015: 35). By doing so, their vision set the scene for and
350 anticipated the rapid and massive diffusion of no-till farming techniques.
351 Today, Argentina is the world’s leading country in no-till farming tech-
352 niques,³ with a rate of 92% of adopters, and AAPRESID has become a
353 very influential actor on the national and international scenes (Goulet
354 and Hernandez 2011; Goulet 2013; Hernandez 2013).



355 Declarations of a key AAPRESID official about a new agricultural rev-
356 olution reflect her important ambitions for the country and the world.
357 She claims:

358 We take care of the soil for food security, which is essential; and we also
359 want to achieve energy security because we are cultivating energy as well
360 [...] We are working hard toward our 2020 strategy and we are a strate-
361 gic ally for the state partners, because we believe we can guarantee food,
362 energy and environmental security. (AAPRESID official)

363 Interestingly, as the vision of a desirable future attainable through
364 an “agricultural revolution” was taking shape, the dichotomies agri-
365 culture/industry and rural/urban came to be increasingly challenged in
366 the technoscientific sphere, as they were in the political sphere. Crucially,
367 new biotechnologies’ encounter with the vanguard vision promoted by
368 AAPRESID linked that vision with an imaginary of national greatness, a
369 technology-intensive agro-industry that would give Argentina back its right-
370 ful place in the economic geography of the world.

371 Argentina has this thing that even though we are a society that is export-
372 oriented with agriculture and the granary of the world and so on, [...]
373 we are very urban and at the cultural level actually we have this thing we
374 want to be Europe, then... uh... there was a big disconnection that turned
375 out into something else, this super-massive agrarian transformation that
376 included adoption of biotech. (Environmental sociologist)

377 The cultural and organizational change that began with changes in
378 farming practices has indeed been deepened and accelerated half a decade
379 later, in 1996, when Roundup Ready (RR) soy was introduced into
380 the country. Together with glyphosate-based herbicides and no-till farm-
381 ing, RR soy formed a homogenous “technological package” (i.e. actors
382 use these terms to refer to the combination of these three elements to
383 stress their joint and mutually reinforcing diffusion and commercializa-
384 tion), which transformed the paradigm of agriculture well beyond a reor-
385 ganization of production and existing business models. The technological
386 package revolutionized production and dramatically increased soy’s prof-
387 itability, particularly when cultivated on a large scale (Trigo et al. 2002;
388 Pena and Lema 2003). Because of its homogeneity and inherent simplic-
389 ity, and in spite of numerous socio-technical controversies (see Delvenne



et al. 2013 for an overview), the package could easily travel across the country and be incorporated by farmers seeking higher yields and productivity. In turn, this further promoted the invention of a sustainable agro-industry based on the constant incorporation of new technologies (GPS, smartphones, drones, precision agriculture), in which agricultural innovation is portrayed as desirable and most likely to succeed if undertaken by “knowledge workers”. These workers interact across and even beyond the traditional sectors of agricultural value chains. Under this conception, which AAPRESID both represents and reproduces, the farmer is no longer portrayed as the one who cultivates his own lands but rather as a flexible, mobile and innovation-friendly entrepreneur.

401 SOWING POOLS AND THE RISE OF NETWORKED AGRIBUSINESS

402 With the expansion of the technological package, the figure of the farmer
403 has been re-framed into an innovator-entrepreneur who never shies away
404 from taking risks, incorporating new technological features into his collec-
405 tion of sophisticated machines, making his knowledge (technical, financial,
406 agronomic, managerial) available to others through his active involvement
407 in farmers’ associations,⁴ and being perfectly able to integrate networks of
408 producers, investors and input suppliers in a win-win capital accumulation
409 operation.⁵ This emerging figure embodies new relationships and a redis-
410 tribution of roles in agricultural production. While the Green Revolution
411 was based on the production of knowledge by public institutions that pro-
412 vided farmers in need with “top-down” agricultural-technology solutions,
413 farmers themselves now play a central role in the development and test-
414 ing of “bottom-up” innovative solutions. Public institutions are deemed
415 “backward-looking” and incapable of knowing the real needs of farmers.
416 Under this new configuration, private players are seen as best equipped
417 to meet the need for expertise and technical support for farmers, particu-
418 larly through professional organizations such as AAPRESID or AACREA
419 (Goulet and Hernandez 2011). Public institutions’ epistemic author-
420 ity over agricultural innovation is thus challenged by the emergence of a
421 farmers’ identity empowered by farmers’ personal networks and knowl-
422 edge, oriented toward entrepreneurship, and supported by technological
423 innovations, such as biotechnologies, no-till farming and precision agri-
424 culture. This co-produced worldview does not seem to leave any room
425 for family farmers, who do not have the mind-sets of innovators-entrepre-
426 neurs and who are incapable of keeping up with ever-growing demands of



427 capitalization, technologization and land concentration. Their continued
 428 existence as farmers is clearly in peril, now that even public institutions
 429 defending family farming evoke their programmed disappearance:

430 Small producers, people who have very little, five or four hectares, and finally
 431 end up getting subsidies through various channels - that is what they do -
 432 are perpetuating inefficient production. Actually what they ought to do is to
 433 quickly adjust to change and to strive for a better access to infrastructure, edu-
 434 cation, roads. All those people have to leave the rural sector. (Economist 3)

435 Epistemic claims by and about farmers becoming innovators-
 436 entrepreneurs are reciprocally conditioned by the rise of new social forma-
 437 tions such as sowing pools (*pooles de siembra*), which are taken here as a
 438 central instance of this agricultural bioeconomy. Sowing pools can be seen
 439 as instantiating a new hegemonic organizational model of agribusiness
 440 (Grosso 2010; Murmis and Murmis 2012; Gras and Hernandez 2013,
 441 2014). Sowing pools are defined as “agricultural trusts consisting of farm-
 442 ers seeking to extend their scale of production, who gather temporarily
 443 (usually one planting season) to lease tracts of land as well as services for
 444 the main farming operations (planting, spraying and harvesting) and some-
 445 times for transport. They also look for national or international investors,
 446 who may come from outside of the primary sector (banks, finance compa-
 447 nies) as well as inside (agro-industrial firms, providers of agricultural inputs)
 448 to finance soybean production” (Choumert and Phelinas 2015: 134).

449 Some sowing pools operate with their own capital, including land
 450 ownership, but most pool capital from external investors and operate
 451 under short-term contracts (Leguizamon 2014: 153). The managers of
 452 the pools as well as those who do the farming are paid a salary, and inves-
 453 tors receive profits on their investment depending on the export prices
 454 and volumes at the end of the season.

455 In these new social formations, small and medium-sized farmers have
 456 become “unable to catch up with capitalization and land scale demands, [so
 457 they] have opted out of production by leasing their land to larger farmers
 458 or investors, thus becoming rentiers” (Gras and Hernandez 2014: 344).

459 Interviewer (I):
 460 Agronomist 3:

These rentiers what do they do then?
 Usually they are sitting in the pub
 of a village with a cell phone with
 which they can communicate with the

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- 463 contractor; if any decision needs to be
 464 taken he handles it very well at a dis-
 465 tance.
- 466 Interviewer (I): The renters those who stopped farm-
 467 ing who own lands... Some became
 468 contractors and others not, what do
 469 they do?
- 470 Agricultural economist 2 (AE2): These others became nothing. Nothing.
 471 I: They do nothing they live well with
 472 just renting the land?
- 473 AE2: Well, it depends on how much land you
 474 have and the quality of land. If you have
 475 50 ha and live in a village, with current
 476 rent levels you live phenomenally well.

477 Sowing pools' managers, often working from afar in their Buenos Aires
 478 offices, are therefore interacting with landowners to lease the lands they
 479 need, while landowners themselves have also left the fields to live in vil-
 480 lages and small towns. In this configuration, the closest producers to the
 481 land—and the bearers of the new farmer identity—are the so-called *con-*
 482 *tratisistas* (rural contractors), a group of about 12,000 people duly trained
 483 and equipped with the best possible machinery to offer contracted ser-
 484 vices across the country, such as, for example planting seeds, fertilization,
 485 herbicides and insecticides spraying, packaging the harvest, et cetera.

486 Contractors emerge as small producers who have excess machinery and
 487 begin to provide services to the neighbors. Now, why did these small
 488 producers have excess machinery in the first place? That is the question,
 489 why had they bought more tractors? Because in Argentina I would say
 490 historically that there was no mortgage or credit to purchase fields. But
 491 you could access from public banks to buy machinery. So there have
 492 always been plans to purchase more machinery than what was needed...
 493 (Agricultural economist 3)

494 Most of the time, there is no contract, strictly speaking. This is a verbal
 495 agreement between a service provider (the contractor) and its temporary
 496 employer (the manager of the pool or the landowner). Contractors are
 497 very vulnerable to weather conditions, as one bad season means the col-
 498 lapse of their business if they do not obtain sufficient income to cover the
 499 leasing of their machines. Even though the first contractors were small



500 producers with their own machinery, most contractors today lease the
 501 machinery they use in order to benefit from the most recent technologi-
 502 cal advances and to be more competitive on the market of *contratistas*.
 503 The machinery industry incentivizes contractors by providing them free
 504 training sessions and by offering them credit facilities. However, getting
 505 the most recent machines is not always financially possible for every con-
 506 tractor. Those who cannot afford it are thus locked in inferior techno-
 507 logical possibilities (compared to their competitors) and they are paid
 508 with inferior salaries. Contractors have become a central actor in the net-
 509 worked agribusiness of sowing pools.

510 The sowing pool needs *contratistas* like water, because it will go 500 km
 511 away, rent land and seek some service contractors. If he can't find any ser-
 512 vice contractor, the guy [from the sowing pool] is dead. Therefore the sys-
 513 tem is a network. (Agricultural economist 1)

514 Contractors became the vector of innovation, information and knowl-
 515 edge. The quality of the services they offer and the productivity that can
 516 be expected from a sowing season depend on contractors' capacity to
 517 keep up to date with cutting-edge innovations:

518 Each seller of agricultural machines has half its people training *contratis-*
 519 *tas* to use the new machines [...] Because the seller is obviously inter-
 520 ested in that the John Deere machine has the best possible performance
 521 in the field, and to achieve that John Deere trains each type who buys
 522 the machine and offers him an ad hoc course, with yearly updates. Why?
 523 Because it is the form of economic capture when the guy changes the
 524 machine. Have you understood how much the system is innovative? [...] It
 525 is a network of interests. The one leasing lands can pay high rents and
 526 capture more land if he manages to balance his budget. He does not have
 527 to manage the Chicago market, he manages productivity, and productivity
 528 is obtained with contractors. (Agricultural economist 2)

529 The technological package not only transfigured agricultural techniques,
 530 upset traditional roles of farmers, and challenged the epistemic authority of
 531 scientific public institutions; it also transformed agricultural management
 532 into network management.

533 [Previously], informal networks began almost by word of mouth and infor-
 534 mation flowed through more direct contacts; it was not private circuits at



535 that time, this came much later, as now the networks are completely man-
536 aging the distribution of inputs, large multinationals working in seeds that
537 have established their own distribution centers, etc. And you, as a producer
538 you're in a network. (Agricultural economist 1)

539 Among the paradigmatic examples of agribusiness “made in Argentina”
540 is the company Los Grobo which, although it is demonized in the media
541 because it is often accused of abusing its market power, is “cited in almost
542 all of the manuals, courses and reports on agribusinesses as having suc-
543 cessfully changed their mentality” (Gras and Hernandez 2014: 346). Los
544 Grobo developed an innovative vertical integration strategy named “asso-
545 ciative network company”.⁶ The complexity of Los Grobo’s networks has
546 served as a model for agro-industrial specialists and academic programs
547 like Harvard Business School (Bell and Scott 2010). The model is based
548 around building a network of input and service providers, including land-
549 owners, agronomists, contractors and agricultural production branch
550 managers, so that instead of directly hiring employees or owning land or
551 machinery, the company operates through land leases and third-party con-
552 tracting (Leguizamón 2016).⁷ The charismatic Director of the company,
553 Gustavo Grobocopatel, envisioned the transformation of agriculture into
554 a knowledge-based industry and rather than opting for the “heaviness”
555 of lands and machinery, he preferred “an asset-light company: investing
556 in soft assets—top talent, training, and state-of-the-art technology, for
557 example—was a better investment for future growth in the twenty-first
558 century” (Bell and Scott 2010: 5). Of course, not every sowing pool can
559 be Los Grobo. From the basic idea of generating economies of scale by
560 pooling resources have stemmed very different models of sowing pools:
561 informal local pools (50–300 ha), large sowing pools (1000–50,000 ha)
562 and network companies (up to 350,000 ha) (Grosso 2010).

563 A pool is a strategic alliance between people, where the management is
564 centralized. It is the minimum expression of a pool, in my case I have a
565 motorcycle and it is the entire heritage that my pool has (laughs), that
566 and nothing else. Then, you have got that pool with 50 thousand hectares
567 planted, with offices in Buenos Aires, trained economists, own contratistas,
568 10 trucks and 15 agronomists... (Sowing pool manager 4)

569 However, in recent years, and particularly since 2012, producers have
570 been seeing slimmer profit margins for soy (soy was until recently worth



571 600 USD/ton, and it's now around 220 USD) and rising tensions with the
572 government over export taxation. Consequently, many sowing pools have
573 broken up, some have significantly decreased the magnitude of their opera-
574 tions, and still others have diversified their businesses or expanded abroad to
575 neighboring countries. Los Grobo, for instance, moved part of its agricul-
576 tural business to Brazil and also to Uruguay and Paraguay, where the lack of
577 good infrastructure is compensated for by the absence of soy export taxes.
578 The *contratistas*, however, did not cross the borders with the asset-light
579 companies. They remained attached to the lands they usually cultivate with
580 their own machines. Under networked agribusiness, greater power and suc-
581 cess seem to correlate with greater mobility. Those who remain attached to
582 particular pieces of land or particular points in the agribusiness network have
583 fewer options. The mobility of powerful actors is not limited to geographic
584 mobility: because the cost of coordination of its network had become
585 too expensive in relation to soy's decreasing profitability, Los Grobo (and
586 other mega-network companies) expanded its network into other agribusi-
587 ness activities, such as the production of fertilizers and other agroindustrial
588 inputs and even digital agriculture.⁸ This seems to be a general trend, which
589 has been highlighted by Murmis and Murmis (2012: 496): "once a certain
590 scale is reached, other avenues of business expansion start to dominate as
591 the companies receive foreign investments, initiate projects in neigh-
592 boring countries, move along or integrate additional parts of the supply chain,
593 and create or extend networks with different levels of inter-company inte-
594 gration". They add that network companies "seem to progress through an
595 evolutionary path to a form where other non-farming avenues of business
596 expansion start to dominate" (Murmis and Murmis 2012: 496).

597 These observations resonate with the findings of Carla Gras and Valeria
598 Hernandez who studied the evolution of the heterogeneous large-scale
599 farming sector in Argentina from the neoliberal 1990s onwards (Gras and
600 Hernandez 2014). They found that the impact of neoliberalization has
601 differently impinged on the category of large-scale farmers. According to
602 them, network companies adopt inter-sectorial business models, are more
603 flexible, and are less anchored in specific territories, and therefore are
604 much more likely to adapt to changing circumstances than the traditional
605 capitalist actors (agrarian bourgeoisie or large-scale farmers below the scale
606 of network companies). Gras and Hernandez (2014) conclude that the
607 remarkable growth of Argentinean agricultural production was accompa-
608 nied by a transformation of the agrarian capitalist class that weakened the
609 traditional capitalist firms and favored the networked agribusinesses.



CONCLUSION

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611 The bioeconomy is relatively new in Argentina as a concept and a political
612 project. To understand its emergence and to anticipate its future as a
613 political project, this chapter has examined four decades of co-produced
614 transformations at the political and technoscientific levels. ‘Agribusiness’
615 looks like the habitat of today’s bioeconomy in the country. It encapsu-
616 lates “a new worldview [not limited to] specific technological or organi-
617 zational innovations, but rather a systematic change that involves material,
618 ideological and symbolic elements” (Gras and Hernandez 2014: 345).
619 Agribusiness gained a hegemonic position; it contributed to regularizing
620 and stabilizing the course of capital accumulation, including the “dis-
621 placement of conflicts, and crisis tendencies elsewhere and/or into the
622 future” (Jessop 2008: 27). These include, most notably, the denial of
623 the numerous socio-technical controversies on social and environmental
624 impacts attributed to the “soyization of Argentina” (see Delvenne et al.
625 2013 for an overview), such as deforestation, the displacement of indige-
626 nous populations, tensions with other productive activities like cattle rais-
627 ing, soil degradation because of proliferating monocultures, and a rise of
628 cancers and malformations due the increasing use of agrochemicals (on
629 collective actions challenging the bioeconomy, see Arancibia 2013).

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630 To some extent, for the Argentinean agricultural bioeconomy, macro-
631 trends were clearly over-determined in important ways by the features of
632 the local situation. We have seen that international developments, such
633 as globalization, financialization, or corporatization have as much shaped
634 new social relations and political configurations as local specificities and
635 imaginations, national history, and the internal dynamics of the agricul-
636 tural production system. First, to deal with the aftermath of the structural
637 neoliberal dismantlement of the country, to face the 2001 bankruptcy,
638 and to feed the financial appetite of vulture funds, the Kirchners’ gov-
639 ernments transformed a neoliberal agricultural model into the motor of
640 an export-oriented national-populist system. Second, as part of a global
641 phase of consolidation and transnationalization of the agriculture mar-
642 ket, which was dominated by multinational companies, new techno-
643 logical packages were introduced in Argentina in the mid-1990s. Their
644 adoption was far from mechanical, as the imaginative resources of farm-
645 ers subsequently adapted the technological package in order to propagate
646 their vision of sustainable agro-industry throughout the country. Third,
647 the expansion of the GM soy model was driven by global trends toward



648 capitalization, land concentration, and ‘salarization’; while these trends
649 severely impacted small-scale and traditional capitalist farmers, they also
650 created a favorable environment for “asset-light companies” to flourish.

651 I have characterized this form of agribusiness in terms of networks,
652 in order to stress its engagement with actors through both their (im)
653 material possessions (machinery, know-how, technologies, lands, expert
654 knowledge) and their moral commitment to networks, social capital,
655 diversity and information-sharing. The powerful actor in this imagined
656 world privileges mobility and autonomy over security. S/he should not
657 be attached to a family heritage, such as land, because it equates to fix-
658 ity and immobility. As I have shown, to be successful under networked
659 agribusiness, the farmer—whoever this category today corresponds
660 to—should favor leasing over ownership. This is simply the result of the
661 need to travel light—from one province to another, from one country to
662 another, from one sector to another—to move more easily when circum-
663 stances are changing (Boltanski and Chiappello 2005).

664 Lastly, unlike many other examples of hegemonic policy concepts cir-
665 culating from OECD countries to Latin America (for instance, the con-
666 cept of national innovation systems; Delvenne and Thoreau 2017), the
667 bioeconomy has not been promoted in Argentina as part of a normative
668 agenda of what had to happen in order to “catch up” with Northern
669 countries. Rather, it results from an explicit choice of policymakers
670 to refer to the concept in an instrumental way in order to achieve
671 a national political project that seems to transcend the well-entrenched
672 divisions between self-proclaimed “anti-neoliberal” and conservative
673 governments. As a preferred route for reaping the benefits of the coun-
674 try’s competitiveness, the bioeconomy extends the agribusiness logic that
675 has dominated for decades and, more importantly, it allows a discursive
676 *industrializing* of agriculture. In bioeconomic terms, at least in the way
677 “bioeconomy” is currently used in Argentinean policy arenas, agriculture
678 is thus “diluted” into industry, revamped as just another (Pehlivan et al.)
679 industry that can thus be supported by Peronist and conservative gov-
680 ernments alike, without generating internal contradictions.

681 In Argentina, the bioeconomy is at the center of intense imagina-
682 tive activities to re-think agriculture as-we-knew-it, and to re-name it
683 as “agro-industry”. These developments are evidence of an attempt to
684 reject the idea of agriculture as the reactionary stronghold of a backward
685 bourgeoisie and instead embrace agriculture as generative of an industrial
686 avant-garde that promises political-economic transcendence.



NOTES

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1. <http://www.bioeconomia.mincyt.gob.ar/bioeconomia-argentina/>.

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2. Nestor Kirchner remained very influential until his sudden death in October 2010.

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3. The most technically advanced option of no-tillage is direct seeding: no ploughing is done before planting, which is done directly in the mulch (remains of vegetation) on the ground (hence the term “direct-seeding”).

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Two sine qua none elements are necessary for the realization of these particular seedings: (i) the use of drills designed specifically for this purpose, able to plant the seed using a disk system into unploughed soil, and (ii) the use of chemical herbicides offsetting the absence of ploughing, one of whose functions is precisely to improve the soil structure, and to mechanically destroy weeds (Goulet 2013: 441–442).

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4. In addition to participating in AAPRESID congresses and meetings, medium and large-scale farmers are very often also members of AACREA, a farmers’ association of over 200 local “CREA groups”, distributed in 18 different regions all over the country and focussing on all kinds of agricultural production. In exchange for a fee (between 100 and 500 US\$/month), each member can access the so-called community of AACREA farmers, participate in monthly discussions (gathering 10–15 producers from the same region) and benefit from dedicated R&D support. Each of these groups has a technical coordinator and one of the producers is appointed president of the group for a limited period of time, to voice and represent the group’s interests at regional or national meetings.

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5. The formal training of knowledge workers to act like innovators is also an important asset for the functioning of the system. A press article reporting on the findings of a comparison of the profile of medium-scale farmers in Argentina and the United States revealed interesting findings: the Argentinean average farmer is 7 years younger than his American counterpart (47 years old in Argentina, 54 in the US), almost twice as much educated in universities (4% of farmers in Argentina have a university degree, for only 25% of US farmers) and twice as many Argentinean farmers (10, versus 5% in the US) have postgraduate degrees. See <http://www.lanacion.com.ar/1317397-ventaja-argentina>.

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6. See the company’s website. <http://www.losgrobo.com.ar>.

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7. See also the article published in *The Economist*, “Farming without Fields” (2014), <http://www.economist.com/news/business/21592662-argentine-farming-group-heavy-science-and-light-assets-farming-without-fields>, accessed on 24 of October 2016.

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8. Los Grobo recently partnered with another company to create Frontec, a company that offers farmers “a technological platform that combines the



728 latest in geospatial and agricultural science with ICT, to offer innovative
 729 and sustainable solutions to the agribusiness value chain". See [http://](http://www.frontec.net/eng/)
 730 www.frontec.net/eng/, accessed on 24 of October 2016.

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Insert full stop	(As above)	⊙
Insert comma	(As above)	,
Insert single quotation marks	(As above)	ʹ or ʸ and/or ʹ or ʸ
Insert double quotation marks	(As above)	“ or ” and/or ” or ”
Insert hyphen	(As above)	⊞
Start new paragraph	┌	┌
No new paragraph	┐	┐
Transpose	└┐	└┐
Close up	linking ○ characters	○
Insert or substitute space between characters or words	/ through character or ∧ where required	Υ
Reduce space between characters or words		↑