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EL FUTURO DE LA ALIMENTACIÓN Y RETOS DE LA AGRICULTURA PARA EL SIGLO XXI:

Debates sobre quién, cómo y con qué implicaciones sociales, económicas y ecológicas alimentará el mundo.

THE FUTURE OF FOOD AND CHALLENGES FOR AGRICULTURE IN THE 21st CENTURY:

Debates about who, how and with what social, economic and ecological implications we will feed the world.

ELIKADURAREN ETORKIZUNA ETA NEKAZARITZAREN ERRONKAK XXI. MENDERAKO:

Mundua nork, nola eta zer-nolako inplikazio sozial, ekonomiko eta ekologikorekin elikatuko duen izango da eztabaidagaia

Silicon Valley's Imperial Innovation System and its implications for the Agricultural Sector

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Raúl Delgado Wise

We are witnessing a new stage in the development of the productive forces of society where *patents* have become a key component of the imperialist system of domination under the aegis of neoliberal capitalism. This phenomenon takes place within the framework of what Samir Amin (2013) conceives of as the *era of generalized monopolies*, where the overflowing levels of concentration and centralization of capital have reached unbearable levels. A central and relatively insufficiently studied aspect of this process is the profound restructuring process followed by innovation systems during the last two and a half decades, where the expansion, concentration and private appropriation of the products of the *general intellect*ⁱ have reached unprecedented rhythms and levels. This trend far from favouring a progressive route in the development of the productive forces of society, has inaugurated a regressive and obscurantist path in the advancement of knowledge, which deepens unequal development and exacerbates the current capitalist multidimensional crisis placing at risk the very material bases of life —work and nature— a problem that that acquired global and indeed planetary proportions and a civilizational reach.

The main aim of this paper is to unravel some of the basic characteristics of the restructuring process experienced by innovation systems under the aegis of neoliberal capitalism —focusing on Silicon Valley's imperial innovation system— to analyse some of its implications for the worldwide expansion of agribusiness and its control over the agricultural sector.

The emergence of Silicon Valley's Imperial Innovation System

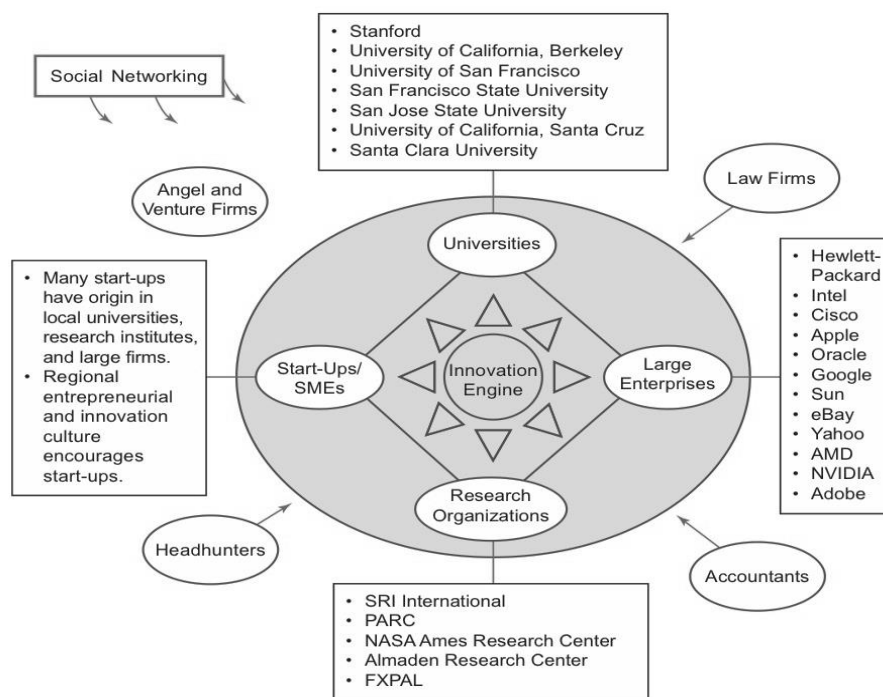
The *restructuring of innovation systems* through which large corporations headquartered or with venture capital posts in Silicon Valley manage to place at their service the human capacity to produce knowledge as a crucial force of production, concentration and centralisation of capital both in the centre and the periphery, reducing labour costs, transferring risks and responsibilities, and capitalizing on the benefits through the appropriation and concentration of patents (Delgado Wise, 2015; Delgado Wise & Chávez, 2016; Míguez, 2013).

This has resulted in what could be conceived of as an *Imperial Innovation System* characterized by:

- a) The increasing internationalisation and fragmentation of research and development activities by the organization and promotion of collective forms innovation: peer-to-peer, share economy, commons economy and crowdsourcing economy through what is known as *open innovation*. In contrast to the traditional innovation processes occurring 'behind closed doors' in research and development departments internal to large multinational corporations, this trend includes the opening and spatial

redistribution of knowledge-intensive activities with a growing participation of external partners, such as *start-ups* —that operate as privileged cells of the new innovation architecture—, suppliers of risk capital, head-hunters, firms of lawyers, subcontractors, universities, research institutions, etc., to create complex ‘ecosystems’ of innovation (Chesbrough, 2008). This new modality of organizing the *general intellect* has given rise to a permanent configuration and reconfiguration of innovation networks that interact within a complex institutional array commanded by the large multinational corporations and the Imperial State (see figure 1), which transcends, increasing complexity and dynamism, at compulsive rhythms, the previous forms of enhancing technological change;

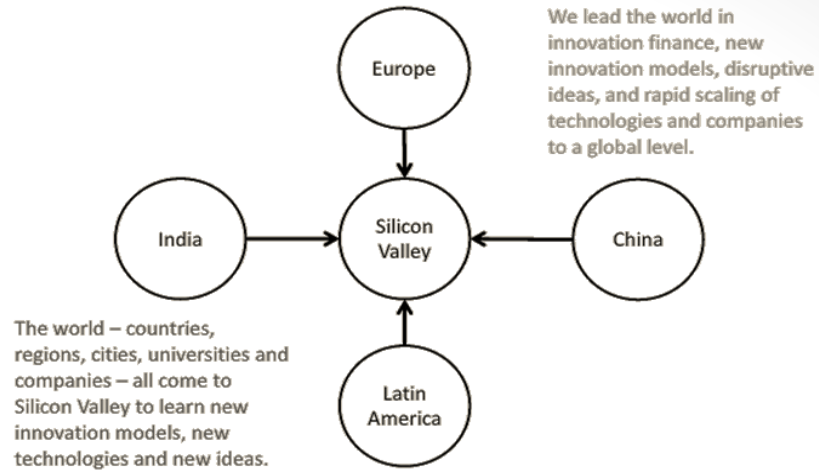
Figure 1: The Silicon Valley Ecosystem



Source: Strategic Business Insights

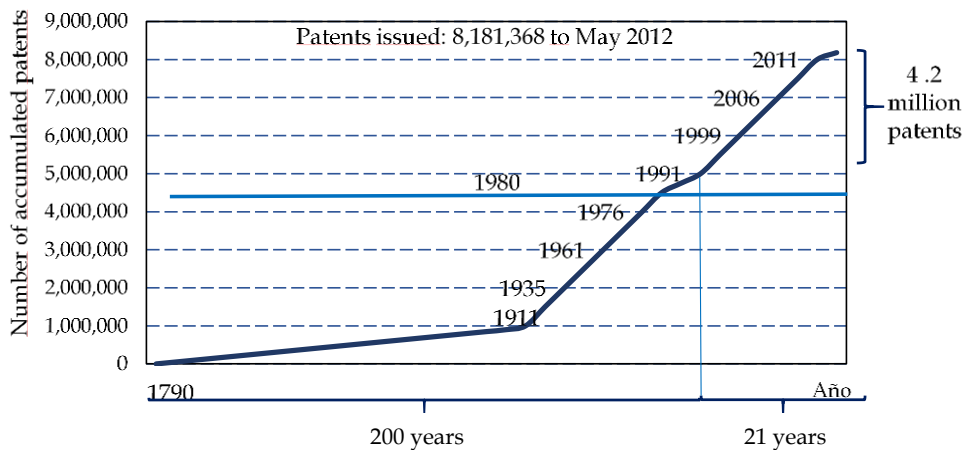
- b) The creation of scientific cities —such as Silicon Valley in the United States and the new ‘Silicon Valleys’ established in peripheral or emerging regions, principally in Asia— where collective synergies are created to accelerate innovation processes (Sturgeon, 2003). In fact, as conceptualised by Annalee Saxenian (2002 y 2006), it embodies a new georeferenced paradigm of innovation based on flexibility, decentralization and the incorporation of new stakeholders that simultaneously interact in local and transnational spaces. Silicon Valley stands as the central pivot of a new global innovation architecture surrounded by a constellation of scientific maquiladoras allocated at peripheral spaces;

Figure 2. Silicon Valley: Global Centre of Innovation



- c) The development of new methods of controlling research agendas (through venture capital, partnerships and subcontracting, among others) and appropriating and concentrating the products of scientific endeavours through the *acquisition of patents* by large multinational corporations. Actually, the rhythm of patenting has increased exponentially in the last two decades: between 1991 and 2011 an overflowing dynamic of patenting has taken place in the United States, where more patents were registered than in 200 years of previous history (see figure 3);

Figure 2. Evolution of the patent registered in the United States



Source: Smith, 2012

- d) The rapidly expanding highly-skilled workforce — particularly in the areas of science and engineering— in the Global South, is being tapped by multinationals for research and development in peripheral countries through recruitment via partnerships, outsourcing and offshoring (Batelle, 2012). In fact, this spatial restructuring of R&D has crystallized into a new geography of innovation, in which following the pattern of industrial production, R&D is shifting to peripheral economies. In fact, this trend can also be conceived of as a higher stage in the development of the global networks of monopoly capital, as the New International Division of Labour moves up the value-added chain to R&D and giant oligopoly capital captures

the productivity and knowledge of a highly skilled workforce in the Global South; and, most importantly,

Table 1. North-South balance in patent applications, 1990-2010

Direction of flows	Period 1990-2010	Year		Growth rate 1990-2010	Percent distribution		
		1990	2010		1990-2010	1990	2010
Total	820,072	2,922	91,720	18.8	100.0	100.0	100.0
South – North non-OECD to OECD countries *	317,946	654	39,936	22.8	38.8	22.4	43.5
North – South OECD to non-OECD countries *	23,598	54	3,822	23.7	2.9	1.8	4.2
North – North OECD to OECD countries *	464,900	2,208	45,880	16.4	56.7	75.6	50.0
South – South OECD to non-OECD countries *	13,628	6	2,082	34.0	1.7	0.2	2.3

Patent Cooperation Treaty (PCT), World International Patent Organization (WIPO).

*OECD not including Mexico, Chile ni a Turkey.

Source: Own estimations with data from Miguelez, E. y Fink, C. (2012) "Measuring the international mobility of inventors: a new database" WIPO Economic Research Working Paper No. 8 e, WIPO, available in http://www.wipo.int/pct/en/pct_contracting_states.html

- e) The creation of an *ad hoc* institutional framework aimed at the concentration and appropriation of products created by the *general intellect* through *patents*, embodied in the World Intellectual Property Organization (WIPO) and the World Trade Organization (WTO) (Delgado & Chávez, 2016). Since the late 1980s, a trend towards *ad hoc* legislation has been initiated in the United States, in line with the strategic interests of large multinational corporations regarding intellectual property rights (Messitte, 2012). Through regulations promoted by the World Trade Organization (WTO) this legislation has broadly expanded. Through negotiations for the signing and implementation of the Free Trade Agreements, these negotiations have been carried out through the Office of the United States Trade

Representative, who in turn has protected and represented the interests of industries that are intensive in the use of intellectual property. Because of its multilateral nature, intellectual property disputes within the WTO tend to become more complex, so the US strategy also includes bilateral FTA negotiations as a far-reaching means to control markets and increase corporate profits. The regulations established by the Patent Cooperation Treaty —modified in 1984 and 2001— in the framework of WIPO-WTO have contributed significantly to foster this trend.

All of this has led to the unprecedented appropriation of knowledge, as intangible goods, giving rise to an abundant expansion, concentration and private appropriation of the products of *general intellect*, which —far from promoting a progressive path to development in productive forces—has inaugurated a regressive phase in the advancement and application of knowledge. Moreover, sometimes patents are acquired by monopoly capital to prevent or postpone its application with the aim of controlling and regulating markets, giving rise to what Guillermo Foladori (2014) conceives of as "fictitious science" given its speculative character —resembling the notion coined by Marx of fictitious capital.

It is worth adding that in line with the nature and characteristics of the Imperial Innovation System described, the United States stands as the world's leading innovation capitalist power, accounting for 28% of all patent applications through the WIPO system from 1996 to 2010. Taking the total number of OECD countries together (not including Mexico, Chile and Turkey), they account for 90% of global patent applications (see Table 2).

Table 2. Patent Applications PCT-WIPO*

Country	Patent Applications
Total Global	4,482,343
Total OCDE**	4,032,186
First 10 countries	3,673,953
United States	1,237,060
Japan	710,516
Germany	627,460
United Kingdom	216,480
France	212,571
China	208,665
Korea	183,584
Canada	102,917
Netherland	93,105
Sweden	81,595

Note: *Patent Cooperation Treaty (PCT), World International Patent Organization (WIPO). **Does not include Mexico, Chile y Turkey.

Source: Own estimations based on data from Miguelez and Fink (2012).

Agribusiness in the turmoil of the imperialist innovation agenda

Preliminary bullet points.

- During the last two and a half decades, multinational corporations in the food and farming sector have achieved impressive levels of concentration and centralisation worldwide. This process has been led by the, so called, *big six*: Monsanto, Dow, BASF, Bayer, Syngenta and DuPont. The principal areas of investment by these corporations have been: pesticides, seeds, and biotechnology.
- Rather than competing among themselves, the *big six* engage in 'Cooperative strategies and collusive practices between the few major competitors, notably through the establishment of elaborate cross-licensing structures.' (Pesticide Action Network, 2011). Moreover,

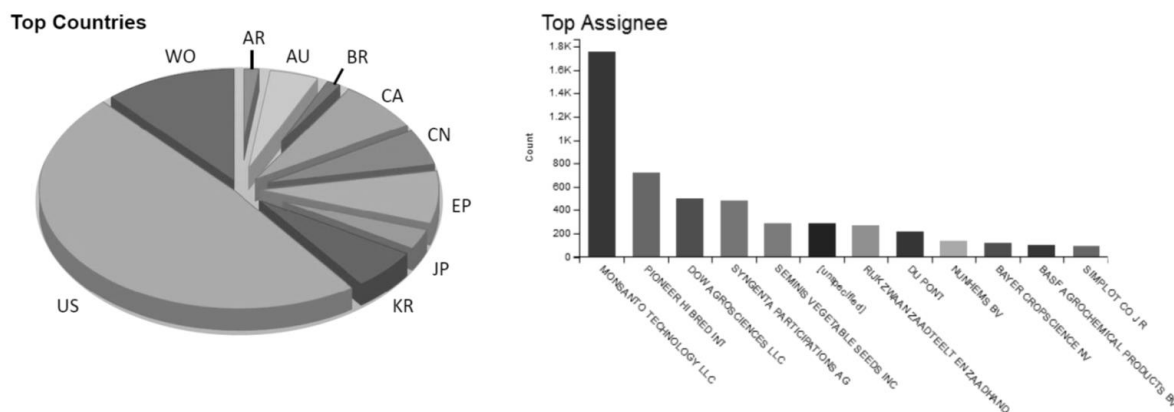
Cooperative strategies include licensing, cross-licensing agreements, subcontracting, and other contractual structures that frame patterns of inter-company alliances. These are current practices in agricultural biotechnology. Indeed, because of the cumulative nature of the genetics and biotechnologies embodied in transgenic varieties, the next innovation is likely to 'stack' traits upon those developed in the previous innovation. To avoid encroaching upon each other's patent entitlements, companies are obliged to enter into licensing and cross-licensing deals. All the leading firms in agricultural biotechnology (including Monsanto) are themselves licensed under various patents, which expire from time to time, covering many products, processes, and product uses. Under a cross-licensing agreement, two parties grant a license to each other for the exploitation of the subject matter claimed in patents. In some cases, cross-licensing is the mutual sharing of patents between companies without even payment of royalties if both patent portfolios are deemed equal in value. (UNCTAD, 2006: 33-34).

- They also promote: 'Vertical integration upward along the food chain, with the establishment of food chain clusters that combine agricultural inputs with the grain handlers' extensive processing and marketing facilities.' (Pesticide Action Network, 2011).
- The unprecedented power secured by the *big six* allow them to: a) control the agricultural research agenda; b) exercise command over trade agreements and agricultural policies; c) position their technologies as the 'science-based' 'solution' for increasing crop yields, feed the hungry and 'save the planet'; d) avoid 'democratic' and regulatory controls; and e) subvert any possibility of promoting competitive markets in line with the hidden neoliberal agenda.
- The monopolistic power exerted by the large multinational corporations in the agricultural sector has far-reaching implications regarding '... the speed of concentration in the agricultural input sector, associated with the privatization

and patenting of biological resources, raises serious competition issues. Further, it raises concerns over social justice and food security.’ (UNCTAD, 2006: 38).

- According to PCT-WIPO statistics in 2015-2016, the number of patent applications by Dow, Bayer, Dupont, BASF, Monsanto and Syngenta were: 804, 761, 758, 714, 290 and 108, respectively. This accounted for 22% of the total PCT-WIPO patent applications in the same period.

Patents issued on Agrobiotechnology 2015



[file:///C:/Users/Ra%C3%BAI%20Delgado%20Wise/Downloads/Clase%2026%20B%20AGBT%202016%20Patentes%20en%20Agrobiotecnologia%20\(1\).pdf](file:///C:/Users/Ra%C3%BAI%20Delgado%20Wise/Downloads/Clase%2026%20B%20AGBT%202016%20Patentes%20en%20Agrobiotecnologia%20(1).pdf)

- There are many examples of investments by venture capital groups of Monsanto, Dupont, Dow and Bayer in cutting-edge start-ups in Silicon Valley. Below are a few quotes that show the increasing connection of these corporations to the Silicon Valley innovation ecosystem.

‘Based in San Francisco, Monsanto's venture capital group invests in cutting-edge Silicon Valley start-ups and sometimes acquires them...Acquired in 2014 by Climate Corp., the technology subsidiary of Monsanto, 640 Labs soon will be doing business in Europe — an ancillary result of Climate's recent acquisition of VitalFields, an Estonia-based software company’.

<http://www.chicagotribune.com/business/ct-monsanto-growth-ventures-1209-biz-20161209-story.html>

‘DuPont Research & Development Center in Palo Alto, California. ‘e Palo Alto R&D Center hosts nearly 200 scientists and engineers conducting enzyme research in biochemistry, molecular biology, protein chemistry, and chemical engineering as well as senior executives, business and regulatory leaders, and intellectual property team members... It is a central site for protein engineering enzyme production systems and pathway engineering for chemicals, and home to applications teams in grain processing, biomass conversion, fabric and household care, and textiles processing.’

<http://www.dupont.com/corporate-functions/our-approach/innovation-excell>
<http://fortune.com/2015/07/15/dow-chief-chemical-science/ence/science/dupont-research-development-centers-worldwide/palo-alto-california-dupont-research-development-center.html>

‘The Bayer LifeScience iHUB in Silicon Valley, USA, is one of several initiatives in order to make sure Bayer leverages digital technologies for its LifeScience businesses. Digital technologies are very important to the future success of Bayer. Bayer is therefore building up competencies in digital technologies, especially with external partners.’

<https://stanford.applysci.com/sponsor/bayer/>

Dow Chemicals is ‘catching up to Silicon Valley’

<http://fortune.com/2015/07/15/dow-chief-chemical-science/>

- Concluding remarks: in many ways, the agricultural sector is at the forefront of the regressive trend and contradictions characterizing innovation (and the control and appropriation of knowledge) in the era of generalized monopolies.

Confronting the dominant trend from below: The Zapatista initiative

Since the end of the 20th Century, Latin America has become fertile ground for some academics and activists who see a new dawning of anti-systemic movements at the global level. Among the main characteristics of these movements are their territoriality, radical autonomy (material and political sovereignty), the striving for direct or participatory democracy, the reaffirmation of culture and identity, the creation of their own education and health systems, the education of their own intellectuals, gender equality, collective and horizontal organization of work and the drive for new kinds of development of the forces of production oriented toward the satisfaction of social needs in harmony with nature (Zibechi, 2015, 2007). The Zapatista movement has played a leading role in this new period of anti-systemic resistance and rebellion. In fact, the Zapatismo has radically redefined the traditional concept of resistance (passive and reactive), changing ‘the resistance struggle into a transformative struggle’ capable of building anew a society free of all exploitation, deprivation, repression and disparagement in the reclaimed spaces under its control. But this not only requires the creation of islands of resistance, but rather archipelagos (see the Sixth Declaration of the Lacandon Jungle) that challenge the capital-ist system with an emancipatory vision and under a liberating and revolutionary rationale.

To transcend the capitalist mode of production, Marx cautioned us in *Capital* (Marx, 1975 [1866]), not only implies the transformation of the social relations of production, ending all kinds of exploitation of man by man; it also implies the need to create a new technical mode of production in accordance with new social relations. Just as capitalism, in its early stages inherited the technical mode of production from feudalism and transformed it according to its own norms and logic, moving from humanity's pre-history —in reference to all forms of social organization divided into classes— to history, that is, to a society with-out classes, necessarily requires moving from the capitalist technical mode of production to one that transcends it. This need becomes even more imperative in the current stage of capitalism, characterized, as mentioned before, by the broad dominance of monopoly capital that, in its insatiable pursuit of wealth, turns the progressive character the Marx attributed to the development of the forces of production under capitalism in its contrary: a regressive path toward progress that subverts nature and life itself.

From this last perspective, Zapatismo, like other Latin American social movements, proposes to foster development of the productive forces that privilege their use value and which are in harmony with nature. Education is a fundamental part of this machine, imbuing it with the 'most realistic and true curriculum, that convey that which the people truly need for their liberation' with an eye toward 'fostering and empowering scientific consciousness and critical thought, as intellectual weapons of the resistance and the struggle of the Zapatista communities, in search of a new world, very different from the capitalist one, and which 'encompasses many worlds' (Aguirre Rojas, 2008: 189).

Zapatismo is contemporary in the way in which it has raised a social opposition to that which has lasted far too long. It does not seek to roll back the wheel of the days travelled toward some lost arcadia, that nostalgic moment of creation, nor derail the train of progress. It seeks something more concrete and ambitious: a new age (Villoro, 2016: 18)

Furthermore, with a view toward advancing an effective knowledge-based dialogue with representatives of the 'hard sciences', a meeting was organized in December 2016 in San Cristóbal de las Casas, Chiapas: "The Zapatistas and the *ConCiencias* for Humanity".ⁱⁱ In the context of this meeting, Subcomandante Insurgente Galeano made the following comment:

...if the children that 25-30 years ago were born during the preparation for the uprising and those that were born 15-20 years ago were born in resistance and rebellion; those born in the last 10-15 years were born in a process of consolidated autonomy, with new characteristics, among which is the need for Science. (Subcomandante Insurgente Galeano, 2016)

This comment reveals, plainly, the deep meaning of the initiative: to establish a bridge between a world in resistance where non-capitalist social relations have been incubated, with those who personify the advances achieved by knowledge under capitalist modernity in hopes of opening routes toward an alternative path of the development of knowledge for transformative change. And if although this is only a first, tentative step toward transforming the technical mode of capitalist production and reorienting toward an *alternative modernity*, it is nevertheless an effort with enormous potential to advance new anti-systemic social movements, reaffirming the strategic importance of Zapatismo for them.

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Nazioarteko Hizketaldia

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ⁱ ‘The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it; to what degree the powers of social production have been produced, not only in the form of knowledge, but also as immediate organs of social practice, of the real-life process.’ Marx, *The Grundrisse*, 1976 [1858].

ⁱⁱ *ConCiencias* — literally, ‘WithScience’ and a play on words for ‘conscience’.