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SPECIAL FEATURE: ORIGINAL ARTICLE

Promises of Bioeconomic Change as a Strategy for avoiding Socio-ecological Transformation

Bioeconomy as a promise of development? The cases of Argentina and Malaysia

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Abstract

All bioeconomy strategies contain certain claims and promises, though these differ from one world region to another. Proceeding from an analysis of bioeconomy debates and the appropriation of the concept by key actors in Argentina and Malaysia, we argue that both countries regard the bioeconomy as a development strategy primarily geared towards the industrial upgrading of agricultural value chains. Its aim is to increase value added in the soy (Argentina) and palm oil (Malaysia) commodity chains by adding further domestic processing steps and developing new branches of industry. This is to lead to social and environmental upgrading and enable the countries to outgrow their subordinate role as biomass exporters. Referring to the world-systems approach and the global value chain literature, we argue that such upgrading strategies must be understood in the context of the hierarchical global division of labour and the position of individual countries in global markets. We show that the promises of industrial, social and environmental upgrading associated with hegemonic bioeconomy visions in Argentina and Malaysia have failed to materialise. Very few new jobs were created, while soybean and palm oil production continue to rely on environmentally harmful techniques. The socioecological long-term costs of the current production model remain unaddressed and unresolved, primarily because property relations and the underlying profit-oriented production model based on mechanisation, monocropping and a greater use of pesticides are never questioned. Should Argentina and Malaysia continue on their current paths, their chances of attaining the bioeconomy's purported socioeconomic and environmental goals are very slim.

Keywords Bioeconomy · Development · Industrial and social upgrading · Malaysia · Argentina

Introduction

Generally regarded as an agenda for the transformation of the global economy, the bioeconomy holds a whole range of promises. It is often claimed that it has the potential to feed humanity, boost economic growth, mitigate climate change and stop the overuse of resources (Virgin and Morris 2017, p. 4; OECD 2009: 7). Since the beginning of the debate on the bioeconomy within the OECD in 2009, numerous countries have adopted (parts of) the organisation's policy agenda in the form of their own national strategies (Backhouse et al. 2017: 10). Nevertheless, bioeconomy approaches differ from country to country and from region to region in their specific orientation (ibid.; Hausknost et al. 2017; Kleinschmit et al. 2014).

Focussing on Argentina and Malaysia—two countries that have been seeking to extend processing activities in their primary sector for decades and today view themselves as regional bioeconomy pioneers—we argue, that it is essentially the hope for industrial upgrading that drives the expansion of biomass production in the context of establishing a bioeconomy in both countries. Advanced industrialised countries primarily associate the transition to a post-fossil economy with the potential for growth and welfare benefits

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(Birch and Tyfield 2015, p. 11). Argentina and Malaysia, which rely on the export of agricultural goods, tie the bioeconomy to the pursuit of industrialisation and socioeconomic development—supposedly in line with ecological sustainability requirements. We, therefore, argue that both countries construe the bioeconomy as a comprehensive development strategy. Crucial pillars of this agenda are an increasing application of biotechnology and a prospect of upgrading of their biomass value chains.

There are at least two reasons why the Argentinian and Malaysian foray into the bioeconomy may appear surprising. First, contrary to the basic idea of a bio-based economy, it has long been argued that soybean production in Argentina and palm oil cultivation in Malaysia are driving climate change by destroying (rain-)forests, depleting soils, and gradually eroding both countries' rich biodiversity (e.g. Teubal and Giarracca 2013; Pengue 2015; Greenpeace 2007). Second, the bioeconomy debate has mostly focussed on advanced industrialised countries with a high per capita income; yet, Argentina and Malaysia are classified as less industrialised upper middle-income economies. These two aspects call for a closer investigation of the bioeconomy strategies of these two countries.

Proceeding from the global value chain approach (e.g. Bair 2005; Gereffi 2014), this contribution discusses the extent to which Argentina's and Malaysia's bioeconomy strategies might deliver on the promise of industrial upgrading of the agricultural sector. Furthermore, we investigate whether an industrialisation of biomass production really has the potential to create improved working and living conditions in rural areas and whether the bioeconomy is conducive to resource conservation and emissions reduction targets as claimed by its advocates. In this sense, we consider the adequacy of the current agro-industrial production models of Argentina and Malaysia for realising the vision of reconciling growth and the improvement of the socioeconomic status of rural communities with environmental sustainability, as suggested in the bioeconomy strategies of both countries. Therefore, this contribution goes beyond the conceptual question of how different bioeconomies are constituted (Hausknost et al. 2017; Dietz et al. 2018), the problems they entail (Birch and Tyfield 2013; Giampietro 2019; Vivien et al. 2019) or the extent to which the bioeconomy has already been implemented (Bringezu et al. 2020). Instead, we focus on the specific hopes that Argentina and Malaysia attach to the concept of the bioeconomy and the paths that both countries are taking in pursuit of their proposed visions. The article starts off by classifying the bioeconomy initiatives of Argentina and Malaysia based on the debate on industrial, social and environmental upgrading as paths to development. Although the debate displays a rather technical understanding of upgrading, it proves useful as an analytical perspective to understand how the diverse actors involved comprehend development processes. This is followed by an overview of the key economic indicators of both countries. On this basis, we engage in a three-level comparison of Argentina and Malaysia that begins by highlighting the countries' shared bioeconomy-related goals and the associated promises. Next, we inspect the actors that have integrated the bioeconomy into their agendas and are driving it forward. Finally, we expound the agricultural relations in each country and the socioecological impacts that a consolidation of the bioeconomy may entail.

The analysis of the Argentinian and Malaysian bioeconomy initiatives presented here is based on various sources. In the case of Malaysia, they include the leading bioeconomy strategy, titled the Bioeconomy Transformation Programme (BTP) (Bioeconomy Corporation and MOSTI 2013), as well as progress reports (e.g. Bioeconomy Corporation and MOSTI 2012), policy papers and a sub-programme of the bioeconomy strategy aimed at the development of rural communities (Bioeconomy Corporation and MOSTI n.d.). Although Argentina has yet to formally approve a bioeconomy strategy, numerous policy papers have been published by various ministries, such as the Ministry of Science (MINCyT n.d.) and the Ministry of Agriculture (MINAGRO 2016), in addition to a cooperation agreement between five ministries[1] (MINCyT et al. 2017) as well as programmes and policy proposals by other key actors (de Cereales and Wierny 2015). Furthermore, presentations from 13 bioeconomy conferences and press releases were evaluated for the analysis of the Argentinian case. Besides this, semi-structured interviews were conducted with 13 bioeconomy experts (entrepreneurs, researchers, ministry staff) from Argentina (8) and Malaysia (5). The focus of the interviews was placed on the vision, key areas, opportunities and challenges associated with the bioeconomy in each country. The compiled empirical material was contextualised with critical analyses of the impact of soybean and palm oil cultivation in each country and with our own research. For our interpretation of the research data, we relied on qualitative content analysis (Mayring 2015), so as to identify latent and manifest bioeconomy visions against the background of the economic position both countries occupy in the world economy. The theoretical debate outlined in the following section functions as a heuristic framework.

[1] The Ministry of Science, Technology and Productive Innovation, the Ministry of Agroindustry and the Ministry of Production signed a bioeconomy framework agreement in July 2017 that initiated their cooperation on bioeconomy-related activities. Three months later, they were joined by the Ministry of Environment and Sustainable Development and the Ministry of the Interior.

Upgrading as a mode of development

In order to better understand the relation between bioeconomy strategies and development efforts in Argentina and Malaysia, we propose a critical consideration of the debate on upgrading. In addition, we situate our line of argument within world-systems theory and discuss the structural conditions that cause capitalist development processes to be uneven and deviate from the example of early-industrialised western countries.

As part of the global value chains approach,[2] the debate on upgrading focuses on the ways in which structural changes affect value creation, production processes and labour relations (Butollo 2014: 16). Generally, "industrial upgrading" refers to a "process by which economic actors—nations, firms and workers—move from low-value to relatively high-value activities in global production networks" (Gereffi 2014: 18). Consequently, industrial upgrading involves a qualitative improvement of the position of economic actors within value chains and thus on the global market. Although the term upgrading is primarily used to describe industrial processes, it can also be applied to agriculture (Bernhold 2019; Barrientos and Visser 2013). Agricultural upgrading is characterised by a shift from low-skilled, labour-intensive activities to technology- and knowledge-intensive forms of commodity production with higher value added.

In parts of the literature on value chains and industrial upgrading, it is argued that an improved position within the global division of labour leads to better working conditions in corresponding sectors (Milberg and Winkler 2011; Butollo 2014; Barrientos et al. 2011; Fischer 2020). This process is referred to as social upgrading. More specifically, the term implies higher income levels, improved labour rights and work standards as well as the expansion of workplace democracy (e.g. rights to codetermination/co-management) (Barrientos et al. 2011, p. 324). Bair and Werner (2011, p. 989) criticise that the commodity chain literature contains an incorporation bias, as it is often implied that upgrading almost automatically results in higher levels of inclusion of both people and production locations throughout these chains. In reality, however, it can be shown that geographies of uneven development are often aggravated when commodity chains are upgraded and that this mostly occurs along existing lines of social inequalities (Bair et al. 2013).

[2] Based on the relevant literature on the subject (such as Fischer et al. 2010), we use the terms 'global value chain' and 'global commodity chain' synonymously in this text, even if they come from different theoretical traditions (see below).

The investigation of Argentina's and Malaysia's efforts towards industrial and social upgrading in the context of establishing a bioeconomy raises the question of whether production processes could in fact really undergo environmental upgrading as part of these countries' strategies towards sustainable development. Informed by the literature on value chains, Marchi et al. (2013) define environmental upgrading as a process aimed at containing or avoiding the environmental damage caused by produced goods, production processes or control systems. Environmental upgrading thus involves reducing ecological footprints, lowering CO_2 emissions and diminishing resource consumption, while more strongly responding to the need for processes of natural regeneration. In this understanding of upgrading, the term suggests a transformation of production processes regarding environmental sustainability. Marchi et al. apply the concept primarily to companies using upgrading measures for eco-branding (product upgrading) or as an eco-efficiency strategy (process upgrading). Such notions of environmental upgrading (see also Navarette et al. 2020; Khattak et al. 2015) emphasise the competitive advantages enjoyed by businesses but fail to consider concomitant processes of socioecological change. Moreover, these approaches are essentially based on the assumption that social and ecological problems are almost automatically resolved by establishing a processing industry and introducing innovative technologies (Unmüßig et al. 2015, p. 178). However, as has been pointed out by political ecologists (e.g. Robbins 2012: 15 f.) and in the critical debate on development (e.g. Becker et al. 2007; Sachs 1999), under capitalist conditions neither industrialisation nor the deployment of technology as such have ever been empirically proven to solve environmental or social problems. Instead, they often reproduce or exacerbate existing uneven development patterns, social inequalities and environmental degradation, or they merely shift these grievances in spatio-temporal terms (Fischer et al. 2021; Svampa and Viale 2014).

In the value chain literature, it is assumed that the position of nation-states on the global market is determined by the organisation of industrial value chains and the power relations between the involved economic actors. As a result, the governance structure within and the control of these chains directly determine a country's chances of using upgrading as a mode of capitalist development (Fischer and Reiner 2012, p. 29). Complementary to this conceptualisation of upgrading, the world-systems approach views value chains as hierarchical networks connecting different modes of production and forms of division of labour within the framework of the global market. The approach suggests a structural differentiation of the world-system into centre and periphery. Driven by the accumulation dynamic of capital, the axial division of labour leads to a large part of surplus value being realised in

Table 1 Selected socioeconomic indicators Sources: Authors' elaboration; data taken from UNCTAD 2019: 37, 133 (No. 5: Ainsuain and Echaguibel 2012: 93; Kotecha and USAID 2018: 2)

No.	Index	Argentina	Malaysia	Years
1	GDP (Gross Domestic Product)/per capita in constant 2010 US$	10,471	10,734	2013–2017
2	HDI (Human Development Index)	0.8250 (rank 45)	0.8022 (rank 55)	2013–2017
3	Proportion of service sector workers in the total workforce	76%	60%	2013–2017
4	Proportion of agricultural workers in the total workforce	1%	12%	2013–2017
5	Proportion of arable land cultivated with soy or palm oil	Over 50%	Over 66%	2011 and 2017
6	Share of raw materials in total exports (in US$)	69%	35%	2013–2017
7	Share of agricultural products in total exports [plus] proportion of agricultural output used for (agro-)fuels (in US$)	59% + 4%	13% + 18%	2013–2017

the capitalist centres (Wallerstein 2019: 23 f.) and profits being distributed unilaterally (Wallerstein 2004: 519). Centre-typical production processes are considered to be relatively monopolised in the core regions of the world-system (Wallerstein 2019: 23). Core countries more often produce capital goods and sophisticated services, while peripheral countries ideally extract raw materials and produce agricultural goods (Schmalz 2018: 29). This leads to an unequal and uneven division of labour. Semi-peripheral countries occupy a middle position in the world-system. Among other factors, they are often characterised by a desire to increase the efficiency of their domestic companies with the aim of strengthening global competitiveness and increasing the import of products and technologies from core countries, hoping to eventually ascend to the centre themselves (Wallerstein 2019: 35 f.).

From the world-systems perspective, upgrading strategies can be understood as devices for improving the position of a national economy on the global market. However, with a view to power relations at the macro-level, the relationship between the centre and the (semi-)periphery must also be taken into consideration. Within this structural relationship of inequality, (semi-)peripheral zones cannot simply outgrow their dependent status through upgrading. In the context of a global division of labour, they fulfil specific functions which the countries of the core have a profound economic and political interest in preserving—if necessary, even by force. In the case of the bioeconomy, the early-industrialised countries focus in particular on retaining their technological competitive advantage. This objective ostensibly counteracts the aspirations of (semi-)peripheral countries to outgrow their subordinate position on the global market and thus their dependency on the centre by establishing a bioeconomy through upgrading. Hence, the question of whether industrialisation in the (semi-)periphery entails positive economic or socioeconomic effects is determined by the power relations within and the dynamic development of the global market as well as by a country's specific role in the global division of labour. Correspondingly, upgrading as a strategy of capitalist development must be understood in a global, not a national context (Fischer 2020).

The assessment of Argentina's and Malaysia's bioeconomy strategies in the light of chain upgrading measures under consideration of both countries' position within the capitalist world-system provides the basis for a critical analysis of analysis of the specific development targets they attach to their agro-industrial production, how they intend to achieve them and what structural obstacles they face in establishing a bio-based economy.

Most analyses in the commodity chain literature focus on processes of industrial upgrading that individual companies or commodity chains have already completed. These studies examine whether a process, product, functional or chain upgrade (or downgrade) has taken place and, if so, whether it was paralleled by social and/or environmental upgrading. The bioeconomy, by contrast, is still a field in the making, a contested term of which differing understandings coexist (Backhouse et al. 2021). Before we analyse the promises attached to the bioeconomy in both countries, let us briefly look at some key economic indicators of the two economies.

Selected economic indicators

From a world-systems perspective, Argentina and Malaysia occupy a semi-peripheral position on the global market (Babones 2005).Over the last few decades, both have attained a significant level of specialisation in the agro-industrial export of soy and palm oil. Located in distinct world regions, they differ considerably both culturally and politically.

As Table 1 illustrates, Argentina and Malaysia display a number of similarities in terms of economic strength and living standards: between 2013 and 2018, per capita GDP was slightly above $10,500 and the Human Development Index ratings were above 0.8 in both countries. Most workers are employed in the service sector, with only 1% of the Argentinian workforce employed in agriculture; in Malaysia, by

contrast, some 12% of the working population are employed in this sector. Despite the soybean sector's low demand for labour, more than half of Argentina's cultivated farmland is used for soy production (Ainsuain and Echaguibel 2012: 93). In Malaysia, oil palms occupy more than two-thirds of the agricultural land (Kotecha and USAID 2018: 2). While Argentina's dependence on agricultural exports, comprising some 59% of total exports, is much greater than in Malaysia, the role of agrofuels is far greater in the latter. In 2017, palm oil was Malaysia's fourth most important export good, accounting for almost 4% of its exports.[3] In Argentina, soybean meal was the primary export commodity, accounting for 15% of total exports.[4] Soy and palm oil are "flex crops" (Borras et al. 2016) that can be used for food, animal feed or agrofuels, depending on world market demand and prices. This makes soy and palm oil production lucrative fields for industrial upgrading within the overarching framework of bioeconomy initiatives.

This short comparison of economic indicators has shown that both countries are important actors in their respective regions in terms of bio-based production processes and research. In addition, they both view themselves as regional bioeconomy pioneers (IICA 2018). These parallels make the two countries suitable cases to study the relation between industrial, social and environmental upgrading coupled with development aspirations within a bioeconomy framework. The strong emphasis of and focus on the development promises that Argentina and Malaysia attach to their bioeconomy initiatives indicate that the two countries are attempting to outgrow their roles as exporters of unprocessed agricultural products by transforming and upgrading their production processes to generate more value added inside their national economies. This aspiration to overcome the traditional economic role constitutes another interesting parallel. Thus far, this aspect has rarely been analysed in the wider academic debate on the bioeconomy (Backhouse et al. 2021; Birch and Tyfield 2013; Bugge et al. 2016; Giampietro 2019; Hausknost et al. 2017; Levidow et al. 2012; Vivien et al. 2019). Long before the concept of the bioeconomy emerged, both countries relied on agricultural exports of soybean or palm oil and have been seeking to upgrade and further process these products within their domestic economies for decades. Even before elaborating their bioeconomy strategies, Argentina and Malaysia were already providing vast amounts of state subsidies to soy/palm oil agrofuel production (Toledo López 2021, p. 246; Arujanan and Singaram 2018).

Argentina's and Malaysia's shared bioeconomy vision: a development strategy based on biotechnology and industrial biomass production

Although the concept of a bioeconomic programme was originally developed by Georgescu-Roegen (1971), his criticism of the unsustainable use of resources in growth-driven economies and the attempt to solve the associated problems through the use of technological innovations is rarely considered in current debates on the bioeconomy (exceptions: Vivien et al. 2019; Mayumi and Gowdy 1999).[5] In contrast, most bioeconomy strategies claim that the deployment of biotechnologies can reconcile constant growth and environmental sustainability without having to fundamentally transform existing economic functional principles. In this context, Vivien et al. speak of a "hijacking of the bioeconomy" (2019). Echoing the debate on sustainable development, it is claimed that biotechnological innovations somehow inevitably lead to an environmentally friendly mode of production. However,

> "[t]he discursive strategies of 'sustainable development' have generated a discourse […] co-opted by economic interests, rather than a theory capable of articulating an ecological ethic and a new environmental rationality. It has been a discourse of power, and above all an instrument of the dominant power." (Leff 2008: 13)

With this in mind, we turn to the bioeconomy debates and strategies in Argentina and Malaysia, which are inevitably embedded in the power relations of global value chains and the world market. Both countries initially adopted a bioeconomy vision resembling that of the core industrialised countries (CONICET 2015: 1). According to this conception, the bioeconomy embodies a promise of growth, innovation and environmental conservation.[6] Scholarly studies of official bioeconomy initiatives and policy papers distinguish between two bioeconomy strategies emerging from this vision: the biotechnology/science-based model (e.g. in the US, the OECD countries and Brazil) and the biomass-based model (dominant in Germany and the EU) (Backhouse et al. 2017; Bugge et al. 2016; Kleinschmit et al. 2014). A closer inspection of Argentina's and Malaysia's corresponding agendas calls this typology into question. As we demonstrate in the following, they do not conform to this classification.

[3] See https://oec.world/en/profile/country/mys/, last accessed 2 March 2020.

[4] See https://oec.world/en/profile/country/arg/, last accessed 2 March 2020.

[5] One Argentinian interviewee mentioned Georgescu-Roegen as the intellectual father of the bioeconomy (Interview on May 30, 2018).

[6] See, for example, the German bioeconomy debate https://biooekonomie.de/en/topics/about-the-bioeconomy, last accessed 6 July 2022.

In 2012, Malaysia became the first country in Southeast Asia to adopt its own bioeconomy strategy: the Bioeconomy Transformation Programme (BTP). This programme builds on Malaysia's National Biotechnology Policy (NBP) launched in 2005, which focussed on promoting socioeconomic development and the broad application of biotechnology (Bioeconomy Corporation and Al-Amin 2017: 5; Bioeconomy Corporation and MOSTI n.d.). To accelerate this development, the Malaysian Ministry of Energy, Green Technology and Water launched the Green Technology Master Plan in 2017 (KeTTHA 2017). The BTP is also part of the government's Economic Transformation Programme (ETP) defining Malaysia's long-term socioeconomic development path (Bioeconomy Corporation 2015: 46).

In Malaysia, "bioeconomy" refers primarily to industrialisation and growth. It ties together "the whole process of creating market access, increasing trades, providing jobs and economic growth", installing "sustainable industrial processes" (Bioeconomy Corporation and MOSTI n.d.: 6, 9) while at the same time coping with "environmental pressures" (Bioeconomy Corporation 2015: 20). The country aims at expanding bio-based economic activities that rely on homegrown expertise and innovation to bring it a step closer to its long-term development goals of combating rural poverty, increasing added value in the agricultural sector and advancing the industrial development of its rural regions (Bioeconomy Corporation and MOSTI n.d.: 9). Ultimately, Malaysia hopes that its bioeconomy initiative will lead it into the group of high-income countries. Having originally planned to achieve this goal by 2020 (Bioeconomy Corporation and MOSTI 2013), Malaysia has reframed this endeavour in recent years. In an expert interview with a representative of the Bioeconomy Corporation, the respondent stated that the "implementation" of concrete "bioeconomy projects is challenging", due to a lack of and access to technology, knowledge and financial incentives (Interview Bioeconomy Corporation, 10 April 2018). Against this backdrop, the interviewee argued: "the goal of developing into a high-income country by 2020 was valid. But the new time frame for becoming a global high-income bioeconomy is now 2050" (ibid.). This statement already reveals a modification of the initial hopes associated with the bioeconomy due to structural obstacles.

The Malaysian programme promotes the valorisation of biomass, the upgrading of production and recycling processes in economic sectors such as food production, cosmetics, health and biofuels.[7] Bioeconomy advocates emphasise that the circular economy, digitalisation and industrialisation play just as important a role as the upgrading of the agricultural sector (interview with Bioeconomy Corporation, 10 April 2018). Sustainability, understood as the more efficient use of agricultural waste and by-products, is to be achieved through innovative technologies and processes (Bioeconomy Corporation and Al-Amin 2017: 7).

In general, Malaysia's bioeconomy vision can be understood as a holistic attempt to balance environmental sustainability requirements and socioeconomic development with growth, competitiveness, industrialisation and the expansion of biomass production. Moreover, it is explicitly linked to other major economic strategies of long-term socioeconomic development.

In 2013, a year later than in Malaysia, the bioeconomy debate began in Argentina, too. According to the Argentinian Science Ministry (MINCyT n.d.), the debate on the bioeconomy is of vital importance globally, as it responds to the demands of a growing population, decreasing availability of fossil fuels and the consequences of climate change. This wording is very similar to the European Commission's argument for the need of a bioeconomy (European Commission 2012: 2). Over the years, Argentinian actors have held many bioeconomy conferences and developed their own understanding of the bioeconomy, which is defined in an agreement between five different ministries as follows:

> "A broad field of economic sectors are included in the bioeconomy, which is defined as a new development model based on knowledge and technology, value added, the creation of jobs and the sustainable use of the natural resources that are available in different regions of the country" (MINCyT et al. 2017: 2, authors' translation).

The main objectives of the agreement are to increase value added and create jobs. That is to say, the bioeconomy is explicitly regarded as a development strategy. Despite a lack of specific environmental policies, the agreement mentions the need for a mutually beneficial integration of the bioeconomy and functioning ecosystems, the adaptation to and mitigation of climate change and the reduction of social and environmental impacts. In Argentina, the key bioeconomy actors translate these overarching goals into two specific measures: the use of biotechnology (GMO crops) and agricultural technology (no-till farming). These two elements play a key role within the (bio-)economic imaginary in Argentina.[8] In a more recent publication on Argentina, the claim that the bioeconomy is essentially a development

[7] With the exception of the focus on cosmetics and health (as palm oil can also be used in cosmetics and wellness products), this all applies to Argentina, too.

[8] For a more comprehensive analysis of the Argentinian economic imaginary of the bioeconomy, see Tittor (2021).

strategy is asserted even more emphatically (Lachman et al. 2020).

In sum, Argentina and Malaysia understand bioeconomy as an element or accelerator of their long-term development strategies. Both countries' bioeconomy visions rest on the hope for socioeconomic development through industrial upgrading in accordance with the ecological sustainability requirements. By emphasising the expansion of biomass production *and* the development of biotechnology, both countries seek to improve their position on global and regional markets, hoping to secure strategic positions in emerging green value chains. From a world-systems perspective, it is assumed that both countries' ambition to increase their agroindustries' value added is driven by the aspiration to outgrow their subordinate position on the world market. In this sense, the efforts to expand the (export) sector for processed biomass products can be understood as an attempt to establish centre-typical production processes. This can be further illustrated by the constellation of actors promoting the bioeconomy as a mode of industrial upgrading in Argentina and Malaysia, which we analyse in the following section.

The bioeconomy's key promise: industrial upgrading of agriculture

The development of the Malaysian bioeconomy strategy was entrusted to a group of technocrats, including economic analysts, researchers and engineers, collaborating with private actors in private–public partnerships (PPPs) (Bioeconomy Corporation and MOSTI 2013: 20). The Bioeconomy Corporation, a key entity of the Malaysian initiative, operates under the aegis of the Ministry of Science, Technology and Innovation (MOSTI) and serves as a platform for innovation and cooperation for bioeconomy-related business activities. Whereas a progress report of the BTP suggests that other ministries, such as the Ministry of Agriculture, should be involved in the activities of the Bioeconomy Corporation (Bioeconomy Corporation and Al-Amin 2017: 22), civil society actors such as trade unions or farmers' and environmental associations have not been consulted in the drafting, implementing or monitoring of specific bioeconomy projects. In this sense, the Malaysian bioeconomy appears largely as a project of the political and economic elite.

In Argentina, the Ministry of Science (MINCyT) and the Ministry of Agro-Industry (MINAGRO), which have initiated a number of joint projects with other ministries (see footnote 1), have been the central actors promoting the bioeconomy. In Argentina, the conferences mentioned above attracted a larger audience than was the case in Malaysia. Argentina also provides an online education programme about bioeconomy, in which, according to the programme's coordinator, several thousand people have been enrolled. However, a closer look shows that the tone of the bioeconomy discourse in Argentina is also determined by only a relatively small group of persons[9] who share a particularly optimistic view of technology and technological progress—with almost all of them endorsing biotechnology and genetic engineering. By contrast, social scientists and representatives of civil society are hardly involved at all. The ministries rather court the cooperation of the private sector and advocate the use of PPPs. Several large agricultural associations (such as Aapresid, the no-till farming association) and the Argentinian grain exchange are driving the bioeconomy debate in the country.

Malaysia, with its "full value chain approach", aims in particular at upgrading the agricultural sector (Bioeconomy Corporation and MOSTI 2017: 36). In other words, the projects and sub-programmes that have been launched as part of the country's bioeconomy strategy—designed for the development of the primary sector—follow an industrial approach: "The Malaysian government acknowledged Bioeconomy as one of the key strategic drivers to uplift the nation's development by the adoption of sustainable industrial processes […] and agricultural productivity." Malaysia's projects include the promotion of biotechnological research centres and a rural development programme that is outlined in the Bioeconomy Community Development Programme (BCDP) (Bioeconomy Corporation and MOSTI n.d.). To implement the ambitious goals of this agenda, Malaysia depends heavily on the development of the palm oil sector, as a representative of the Bioeconomy Corporation confirms: "The plantation sector, especially palm oil, is one of the biggest sectors in Malaysia—so it is of course important for the bioeconomy" (interview with Bioeconomy Corporation, 10 April 2018). In 2018, palm oil and palm oil-based products accounted for a significant proportion of the country's export revenues, totalling around MYR63 billion (around €14 billion), and provided some 3 million jobs along the value chain. By upgrading the sector through further processing of palm oil and the widespread use of biotechnologies (ibid.; interview with a scientist from Universiti Sains Malaysia, 8 April 2018), Malaysia seeks to gain a more favourable position on the global market (Bioeconomy Corporation 2015: 5). In doing so, the country moreover aims

[9] It is noticeable that the majority of the people involved are male experts with doctoral degrees primarily in agriculture, biotechnology or marketing. Many of them received their degrees from US or European universities.

at generating a higher value added domestically. Originally, the government had committed to the goal of reaching a total investment volume of MYR50 billion (around €11 billion) by 2020. However, a status report recorded an investment of little more than 10% of this sum by 2016 (Bioeconomy Corporation and Al-Amin 2017). From the perspective of bioeconomy actors, it is the lack of investment that prevents Malaysia from realising successfully developed and implemented innovative bioeconomy projects (ibid., KeTTHA 2017: 10). Investors such as large agricultural corporations are more concerned with developing new land (especially in Indonesia) for agro-industrial use or as real estate investments (interview with an NGO representative, 3 May 2017). Smaller palm oil producers, on the other hand, are unlikely to gain access to the start-up funding and basic technical know-how necessary to apply biotechnologies. Thus, Malaysia has yet to make any significant breakthroughs in developing its homegrown biotechnologies and industrialising the palm oil sector.

Argentinian bioeconomy experts are also focussed on increasing value added in agriculture, namely through the sector's industrialisation. This point is emphasised by an entrepreneur who produces bioethanol from maize and gives the residues to farmers as cattle feed:

> "For us, the bioeconomy means integral thinking [...]. In the livestock industry this may mean generating additional value added from sub-products. The same can be done in crop farming. This makes these activities more profitable as it creates industrialisation processes and provides professional jobs to people who live far away from urban centres. These people are then integrated into the world economy with a higher value added" (interview with an entrepreneur in the bioethanol sector, 12 June 2018, authors' translation).

According to this notion, the bioeconomy emerges from the industrialisation of agriculture, which, in turn, relies on the further processing of agricultural products instead of the export of unprocessed goods. This view is articulated in a similar manner by a bioeconomy expert from the Ministry of Science, who associates the Argentinian bioeconomy with the industrialisation of agriculture and the opportunity to establish an industry for the twenty-first century (interview, 7 June 2018). But the aspiration to improve the Argentinian economy's role in the global value chain is limited: as is the case with many other programmes in Argentina, the ownership structure in the highly transnationalised agribusiness sector remains untouched. Although people regularly claim that Argentina is developing its own biotechnology industry, none of the cooperation partners within (or outside of) the PPP framework is focussed on limiting the powerful position of transnational companies in the country, which is particularly the case in the seed and fertiliser market. This places small producers at a strong disadvantage.

While only few funding programmes have thus far been created as part of the Argentinian bioeconomy framework, a series of pilot projects have been undertaken to promote innovation, leading to the expansion of biotechnology research labs. Numerous programmes have been announced, but due to the Argentinian economic crisis, which began in 2017, and the introduction of a drastic austerity programme in 2018, they remain largely underfinanced. Nevertheless, many relevant documents conceptualise the bioeconomy as if it already existed while, moreover, defining it as the sum of the agricultural, forestry and fishery sectors as well as certain research branches, the food industry and, in some cases, even the catering sector.[10] Based on this definition, it was calculated in 2012 that 15.4% of Argentina's GDP derived from the bioeconomy (de Cereales and Wierny 2015: 18; MINAGRO 2016: 14). Furthermore, 58% of value added in the bioeconomy was created in the primary sector, which, at the same time, made up more than half of the bioeconomy (or 8.9% of GDP) (ibid.). Against this backdrop, bioeconomy actors expect the bio-based economic model to generate some 1.9 million new jobs (Trigo 2016: 30).

As in Malaysia, the Argentinian agricultural sector was attempting to increase value added through upgrading (Bernhold 2019) long before the development of the bioeconomy concept. In 2016, 75% of soy exports were already undergoing at least one further processing step (ibid.: 2). From this follows that the bioeconomy is viewed as a means of improving already existing production models:

> "Argentina was once the breadbasket of the world, producing a lot of wheat [...]. Then we became the supermarket of the world [...]. Now we are focused on branded products, traceability and certification. The bioeconomy means that we will become a boutique in the food sector. Being the supermarket of the world means producing large quantities of pasta, a business in which Argentina is not particularly competitive. Instead, we'll see greater value added by supplying specialist markets; this is the opportunity the bioeconomy holds, in addition to biomaterials and bioenergy" (interview with a bioeconomy expert, 4 June 2018, authors' translation).

This statement of an influential policy advisor suggests that Argentina's role in the world economy is changing and that the bioeconomy is seen as an opportunity to improve the position on the world market by facilitating greater value added. That said, the key products of the bioeconomy in

[10] This procedure is also commonly followed, e.g. in the German and European context (see BMBF 2010; Bringezu et al. 2020).

Argentina produced in large quantities are biodiesel and bioethanol. However, agrofuels are not "boutique products", and even their developers state that Argentinian biomaterials, which are based on agricultural residues, have yet to eke out a niche market (see workshop on biomaterials in Resistencia, Chaco, 31 May 2018).

In general, the endeavour towards the industrial upgrading of soy or palm oil production is a key feature of both countries' bioeconomy agendas. A closer inspection of the main actors and the ways in which they appropriate the bioeconomy discourse suggests a discrepancy between the promises of development and industrialisation that both countries attach to the bioeconomy and the implementation of specific strategies with regard to investment, enhancing the capacity for innovation and improving the socioeconomic situation of rural communities. In Malaysia, private actors follow a different investment strategy than that envisioned in the state's bioeconomy agenda. Domestic capital is primarily focussed on accumulation through speculation and the expansion of the plantation sector rather than through the investment in biotechnologies. On the other hand, given the ownership structure in Argentina's agricultural sector, it is likely that foremost transnational actors would benefit the most from increased value creation here. The level of industrial upgrading to be expected and the opportunities for the advancement of homegrown technologies provided by the bioeconomy appear very limited in both countries. Moreover, as we argue in the following section, neither Argentina nor Malaysia has thus far devised any specific measures to counteract negative socioecological consequences of their envisaged development plans.

Bioeconomy realities: upgrading or long-term destruction of ecosystems and jobs?

One reason for Argentina's self-proclaimed pioneering position in the bioeconomy is related to genetically modified seeds introduced throughout the country as early as 1996. Today, more than 90% of Argentinian soy, maize and cotton is genetically modified (MINAGRO 2016: 19). In the eyes of the proponents of GM crops, genetically modified seeds offer competitive advantages due to higher yields and less required labour input. In addition, GM crops allow for large areas of land to be cultivated using a no-till sowing method—sowing without ploughing the ground—, which is regarded as the ideal of 'sustainable intensification'. Correspondingly, important actors in the agribusiness argue that the no-till method reduces the negative environmental impact of agriculture.

Argentina's strategy of creating new types of products through genetic modification and the heavy use of biotechnology aims at increasing the domestic value added. At the same time, it is argued that genetic modification constitutes a form of process upgrading, as it enables the double cultivation of soy and grain, instead of having to leave the land fallow for one or more vegetative cycles (for a critical view, see: Bernhold 2019: 230). Incidentally, with the introduction of genetically modified seeds, the amount of glyphosate used—the most frequently applied pesticide in Argentina—rose from 39 million litres in 1996 to 369 million litres in 2015. Correspondingly, Argentina today has the highest per capita glyphosate usage in the world (Avila Vazquez and Difilippo 2016, p. 23). This herbicide has a severe impact on health, as increased cancer rates, diseases of the nervous system or birth defects in rural regions indicate (ibid.; Verzeñassi 2014). Another reason why the use of fertilisers has seen such a sharp increase is that soybean cultivation causes extreme soil exhaustion (Pengue 2015, p. 13). Despite promises to the contrary, the no-till sowing method has yet to reverse these trends. Although it may be more soil-friendly than conventional sowing, it is mainly practised on vast monoculture soy plantations that essentially depend on herbicides.

As with the Argentinian initiative, Malaysia likewise relates its bioeconomy programme to global challenges such as reducing emissions, protecting primary forests and improving agricultural yields both qualitatively and quantitatively against the backdrop of a growing world population and climate change (Bioeconomy Corporation 2015: 20). In this sense, the genetic modification of oil palm fruits to increase yields and the development of palm oil-based organic fertilisers, biochemicals or -plastic not only serves as a link between the expansion of biomass production and the development and application of biotechnologies in the primary sector (Parveez et al. 2014), but is also presented as a solution to the above-listed socioecological problems. The production of fertiliser from oil palm waste in particular is seen as an element of a circular production model reducing the negative environmental impact of the palm oil sector (KeTTHA 2017: 142). However, the programme's implementation approach in fact marginalises environmental issues. All the strategy papers and status reports refer only to current bio-based economic activities, the progress in the implementation of socioeconomic and investment incentives as well as the growth and development potential of the bioeconomy, without explicitly stipulating ecological sustainability as an independent objective. Yet, the mainstay of Malaysia's bioeconomy agenda, the palm oil industry, is anything but ecologically sustainable. Slash-and-burn land clearance is often used to make large areas accessible for the plantation economy. This results in severe levels of air pollution, the destruction of complex ecosystems and the displacement of indigenous communities. In the past, oil palm plantations were often (and frequently illegally)

grown on peat soils. These soils are important CO_2 storages. When they are broken up and dug over for cultivation, large amounts of greenhouse gases are released into the atmosphere. This circumstance—and the fact that the expanding palm oil industry has been shown to have a negative carbon footprint—has led the EU to exclude palm oil from supposedly sustainable biofuel production (Kunz and Puder 2018).

Soybean production in Argentina is hardly any *more* sustainable—neither ecologically nor socially. The expansion of cultivation in the country's northeast, which only became technically feasible after the introduction of genetically modified seeds, is leading to deforestation and conflicts over land (Toledo López 2016, p. 197; REDAF 2013; Teubal and Giarracca 2013, p. 30). Soy expansion has subjected rural areas to the logics of the agribusiness and restructured these (social and geographic) contexts accordingly. As a result, many livelihoods, in particular those of smallholders who are not geared towards the world market or exports, have been destroyed. About 70% of seed production, distribution, processing of products and exports are dominated by a small number of transnational corporations (Leguizamón 2016). A major tendency within this form of production is its insignificant dependence on labour; needless to say, this "agriculture without peasants" (Teubal and Giarracca 2013, p. 30) is welcomed by large farms (Mikkelsen 2008).

A report on the Malaysian BTP in 2017 states: "Agriculture today is not only about farming—it's a business" (Bioeconomy Corporation and MOSTI 2017: 58). Consequently, smallholder households are required to become "bio-agropreneurs" in order to keep up with rapid technological developments and the increasing demand for foodstuff as competitive actors on liberalised global markets (ibid.). Both small-scale and large-scale producers are faced with similar challenges: they have to modernise and become industrially organised enterprises oriented towards the global market (ibid.). The programme does not mention the promotion of small-scale agriculture, despite the fact that this latter often relies on mixed-crop cultivation, which indeed improves the economic resilience of producers and is more eco-friendly (Pye et al. 2021). Instead, the BTP focuses on a more efficient management of agricultural production by increasing crop yields and digitalising production so that biological data can be documented and processed. And yet, although smallholders are expected to see an improvement in their socioeconomic position as a result of the use of biotechnologies and guaranteed sales of agricultural products (Bioeconomy Corporation and MOSTI 2017: 58), they start off from differing socioeconomic baseline situations (Cramb and McCarthy 2016, pp. 49–64). That is to say, only smallholders who already have sufficient capital, market access and a certain level of expertise will benefit from policy measures that promote small-scale palm oil production as part of the BTP framework, whereas less well-equipped farmers are unlikely to be granted access to these support measures.

Although Malaysia's bioeconomy initiative emphasises the creation of new jobs, it remains unclear where exactly they are to appear. The programme had predicted the creation of 170,000 new jobs by October 2016, yet only around 27,000 materialised (Bioeconomy Corporation and MOSTI 2016: 28f.). Moreover, new employment opportunities with good working conditions and higher incomes are expected to emerge in the processing sector and in research centres. This highlights the fact that the BTP neglects the poor working and living conditions of 'low-skilled' migrant workers—the largest group of workers in the sector (Ismail 2013: 19f.; Puder 2021, 2022). According to 2014 estimates, the palm oil industry employed around half a million documented and presumably as many undocumented migrant workers on plantations and in processing mills (Pye et al. 2016).[11] The low wages paid to this group of workers provide the Malaysian palm oil industry with a strategic advantage on the global market for agricultural goods, as they help keep the price of palm oil below that of competing products (ibid.). So far, there has been little incentive for producers to replace the cheap labour of migrant workers with costly machinery. Even though the programme is focussed on skill development and the application of technologies, the many agricultural migrant workers performing manual labour are unlikely to be granted meaningful opportunities for skill development (Puder 2019). Furthermore, should the widespread use of technologies in the plantation sector (e.g. for harvesting) become a reality, it can be expected to cut jobs rather than create new ones. The purported social upgrading that is claimed to result from industrial upgrading is, therefore, unlikely to have any positive impact on the work standards and rights of migrant workers in the palm oil industry (ibid.).

In Argentina, the expansion of fully mechanised soybean cultivation has significantly reduced the number of available jobs in rural regions and triggered a massive exodus towards the cities.[12] Even those in favour of soy cultivation admit that the sector generates only 197,000 jobs, or 10% of all jobs in the agro-food value chain, whereas its cultivation takes up

[11] In a more recent study from 2018, it is stated that approx. 840.000 migrants work in the Malaysian palm oil sector without a valid working permit. See https://solidar.ch/wp-content/uploads/2021/03/palmoel_report_2019_d-web.pdf, last accessed 10 August 2022.

[12] Ainsuain and Echaguibel have calculated the number of workers needed to produce various products with an equivalent value added of one million Argentinian pesos: 154 workers for cotton, 123 for tea, 107 for potatoes, 19 for poultry, 9 for milk and only 6 to 7 for soy (2012: 92).

some 58% of arable farmland.[13] Land census data show that the number of farms in Argentina decreased from 421,221 in 1998 to 250,881 by 2018.[14] The workers who were made redundant as a result have little reason to be optimistic about finding new employment opportunities provided by the biotechnology sector, which employs only 2000 to 3000 people (Trigo 2016: 20; MINAGRO 2016: 17). It is difficult to quantify how many people are involved in the processing of soy, or could be, if further processing were to be pursued. Given the low labour-intensity in the soy sector, only very few new jobs have been created in rural Argentina. In fact, the increasing mechanisation and digitalisation of agriculture are further reducing the demand for labour. In sum, the number of jobs created in Argentina's biotechnology sector is quite small, as it is in processing industry, whereas the soybean expansion has actually significantly reduced work opportunities in rural contexts.

Although the socioecological implications of the Malaysian and Argentinian strategies may differ to some extent, they have one thing in common: the (continued) promotion of large-scale monocropping operations. Considering the historical development preceding these strategies in both countries, we argue that measures to mitigate the negative socioeconomic and environmental impacts of the agricultural industry thus far have been almost lacking. Both initiatives fail to address the underlying form of production that is causing so many socioecological problems. The detailed examination of the agricultural models of Argentina and Malaysia calls the socioeconomic and environmental promises attached to the bioeconomy initiatives into question. Both countries' bioeconomy strategies, centred around soy and palm oil production, respectively, face various problems in terms of social and environmental upgrading: local small-scale producers only have limited capacities to improve their own position in the global commodity chain, as these chains are dominated by large-scale producers and heavily influenced by the changing demand for biomass in core countries. In its current form, the prevailing monoculture-based agroindustry, which is dictated by large, transnational companies in both Argentina and Malaysia, contributes neither to environmental protection nor to improving the socioeconomic situation of small producers and rural workers. Without addressing the socioecological problems, which mainly result from intensified production, the mechanisation of agricultural production processes and an extreme exploitation of vulnerable workers inherent in the specific production form of soy and palm oil in Argentina and Malaysia, a successful comprehensive social and environmental upgrading within the proposed bioeconomy frameworks of both countries is highly unlikely.

The bioeconomy in the semi-periphery: same, same but different?

We have argued that the Argentinian and Malaysian bioeconomy strategies represent, above all, development strategies. In contrast to the bioeconomy strategies of the OECD countries, a stronger linkage between the bioeconomy and development can be observed. This applies not only to Argentina and Malaysia, but also other parts of Latin America (cf. Koch 2020 for Ecuador; MCTI 2016 for Brazil) and Asia as well as to South Africa (cf. Förster et al. 2020). Here, the bioeconomy tends to include a series of political initiatives and strategies aimed at improving a country's position on the global market. However, the bioeconomy is increasingly being linked up to the Sustainable Development Goals (SDGs) all over the world (Dietz et al. 2018). Further comparative research is needed to investigate whether the upgrading of domestic production processes is typical of semi-peripheral countries or if it represents a more widely observable endeavour.

According to both the debate on value chains and the world-systems approach, semi-peripheral countries seek to outgrow their subordinate position by moving 'up the chain' through industrial upgrading. As we have argued, this idea is expressed in the bioeconomy strategies of Argentina and Malaysia alike. Concurrent with other bioeconomy agendas, the bioeconomy strategies of the two countries refer to the environmental dimension of the bioeconomy as a form of environmental upgrading. However, sustainability aspects play only a minor role in both countries' bioeconomy agenda. One reason for this is that Argentina's and Malaysia's bioeconomy strategies can essentially be considered industrial upgrading strategies. Both countries equate industrialisation with development, which echoes a rather classical promise of development policy approaches. Nevertheless, in both countries, there has been a shift in the specific understanding of how development will come about, compared to the past: many of the economic policy objectives that both are pursuing through their bioeconomy agendas underscore that today's political actors consider the strategy of import substitution industrialisation[15]—once predominant in Argentina (between the 1940s and the 1960s) and Malaysia (in the 1960s)—to be outdated. They now aim

[13] For example, Mario Bragachini from the Agrotechnical Institute INTA, 15 April 2011, http://intainforma.inta.gov.ar/?p=5880, last accessed 7 September 2020.

[14] These figures can be found in spreadsheets published on the website of the Argentinian Statistics Institute under the heading 'Cuadros estadísticos': https://www.indec.gob.ar/indec/web/Nivel4-Tema-3-8-87, last accessed 28 September 2020.

[15] Import Substitution policies aim at building up certain industries in (semi-)peripheral countries to overcome their dependency on imports. It included a proactive economic role of the state and often

to transition from semi-peripheral production processes to those more typical of the core through higher value added, which, in turn, is to be achieved by upgrading and industrialising the agricultural sector, as well as through the strategic promotion of processed goods exports in key industries. Today's strategies are thus not aimed at protecting domestic industries from the dynamics of the world market, but rather at strengthening the agricultural sector's global competitiveness through specialisation in the industrial processing of biomass, to be additionally enhanced through a domestic biotechnology sector. However, as proponents of the world-systems approach have argued, the hierarchisation of the global division of labour and the position of individual countries on global markets must be taken into consideration when investigating industrial upgrading as a development strategy. A closer look reveals certain shortcomings of the Argentinian and Malaysian bioeconomy agendas as development strategies. The agro-industrial sector, which relies on exports in both countries, has succeeded in inscribing its interests into the bioeconomy agenda thanks to its strong position in both economies. Thus, Argentina and Malaysia are primarily concerned with producing greater value added by processing agricultural products (especially palm oil and soy) and establishing their own industrial processing plants in rural areas with the promise of creating, in the sense of social upgrading, more and higher quality jobs. However, in both countries, the bioeconomy has engendered significantly fewer innovations than (originally) expected and continues to depend on technology imports. The mechanics of the world market and, more specifically, the two countries' structural position within existing value chains and their importance as biomass suppliers make it difficult for them to outgrow their semi-peripheral role.

Moreover, we have established that the promises of social and environmental upgrading which Argentina and Malaysia attach to their bioeconomy visions have failed to materialise. The industrialisation strategies of Argentina and Malaysia partially conflict with existing employment structures in the agricultural sector. Increasing mechanisation and digitalisation are further reducing the demand for labour. As a result, the employment created in Argentina is mainly limited to the biotechnology sector, albeit with the exception of a small number of jobs in industry, too. For the Malaysian case, it remains unclear where and how many industrial jobs will be created within the bioeconomy framework. In its current form, the palm oil industry—essentially the main pillar of Malaysia's bioeconomy initiative—unvaryingly creates mainly precarious jobs taken on by (undocumented) migrant workers, who are entirely ignored and rendered invisible within the BTP.

The socioeconomic implications of Argentina's and Malaysia's development strategies to establish a bioeconomy through industrial upgrading tend to confirm Bair et al.'s (2013) argument that upgrading can aggravate social inequalities, exclusion and unequal spatial development. In both countries, it would appear that existing inequalities remain largely unaddressed by the respective bioeconomy strategies. The global competitiveness of soy and palm oil is based, in Malaysia, on cheap labour and, in Argentina, on the very limited need for human labour in the cultivation of soybean. Whenever jobs are created, they are usually small in number and limited to either high-tech sectors or precarious forms of employment. In both countries, moreover, the income gap between larger and smaller producers could increase even further should the industrialisation of agriculture continue to advance.

Finally, as both production models are based on the intensification of agriculture, these bioeconomy policies entail considerable ecological costs. At first glance, the introduction of biotechnological innovations appears ecologically sustainable by definition. However, empirical evidence shows that industrial agriculture is anything but ecologically sustainable. Nevertheless, neither Argentina nor Malaysia has thus far developed a dedicated strategy to pursue ecological goals. The common form of production on the monoculture plantations of the soy and palm oil industries operates within the prevailing conditions of growth and competitive constraints on the world market. The bioeconomy has yet to deliver on its promises to reduce the environmental footprint and emissions and establish a resource-saving form of production. In Argentina, as in Malaysia, there are ongoing efforts towards making greater use of waste and by-products, and several measures have been introduced to protect the soil, such as the no-till sowing method in Argentina and the production of environmentally friendly fertiliser for palm oil cultivation in Malaysia. Nevertheless, it is the profit-oriented production model, which relies on mechanisation, monocropping and a greater use of herbicides to increase efficiency and leaves property relations untouched, that constitutes an obstacle to socioeconomic improvements for smaller producers in both countries. The socioecological long-term costs of this production model are immense, and the measures stipulated in the bioeconomy strategies fail to adequately address this aspect. From this follows that the ongoing processes in the agricultural sector counteract resource conservation and sustainable production. Consequently, should Argentina and Malaysia continue on their current paths, their chances of redeeming the promise of sustainability or attaining the socioeconomic goals proclaimed by bioeconomy advocates are very slim. Given their one-sided fixation on private investment to boost industrial

Footnote 15 (continued)

high import tariffs. For a more comprehensive analysis of Argentina's Import Substitution Policy, see Rapoport (2008) and Boris (2001).

activities, technological solutions to ecological challenges and the development of national capacities for innovation, neither Argentina nor Malaysia will improve their position in the world-system. The high-tech production segment with high value added remains marginal in the bioeconomy sectors, while the actual extent of industrial processing and the value added in the production of agrofuels are insufficient to have any greater socioeconomic impact.

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