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Patterns of global biomass trade

Implications for food sovereignty and socio-environmental conflicts

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Abstract

In the late 20th and early 21st centuries, global trade in agricultural products grew more than three times faster than agricultural production. Nearly all the new land that had been put into production since 1986 was used to produce export crops. While higher volumes of agricultural production and trade increased the global availability of agricultural products, their benefits and negative impacts are not evenly distributed globally. From a regional perspective, the surge in agricultural production for export is most pronounced in Latin America and in some Southeast Asian and Eastern European countries. This export orientation is often associated with negative impacts on food self-sufficiency and a potential threat to food sovereignty in the producing countries.

This report examines the global evolution of food production and international food trade and identifies related drivers of socio-environmental conflicts. Evidence from case studies of two important agricultural exporters – Indonesia and Paraguay – suggests that the focus on the extraction of primary materials for export (extractivism) in the agricultural sector can be linked to rising potential for socio-environmental conflict. This evidence in turn sheds new light on the third case study on Ethiopia, a country currently modernizing its agricultural sector with the aim of becoming an exporter of agricultural products. Focusing on drivers of land use conflicts, the results presented in this report cover topics of importance for sustainability research and policy at large.

Keywords

Agricultural Production

Agricultural Trade

Agrofuels

Biomass

Drivers of Land Use

Food Regimes

Food Security

Food Sovereignty

Land Grabbing

Land Use Conflicts

Material Flow Accounting

Socio-Environmental Conflicts

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Acronyms

ADLI	Agricultural Development-Led Industrialization	Gt	Gigaton (1 Billion Tons)
AMS	Aggregate Measures of Total Domestic Support	ha	Hectare
BAL	Basic Agrarian Law in Indonesia	IATP	Institute for Agriculture and Trade Policy
BFL	Basic Forestry Law in Indonesia	IMF	International Monetary Fund
Bn	Billion	ITO	International Trade Organization
BVRio	Bolsa Verde do Rio de Janeiro	ITPs	Industrial Tree Plantations
CAP	Common Agricultural Policy	LDC	Least Developed Countries
Cap	Capita	LIFDC	Low-Income Food-Deficit Countries
CRA	Forest Restoration Credit	MFA	Material Flow Accounting
CSO	Civil Society Organizations	Mha	Million Hectares
CSR	Corporate Social Responsibility	NTB	Non-Tariff Barriers
DAP	Desarrollo Agrícola del Paraguay	NTM	Non-Tariff Measures
DBE	Development Bank of Ethiopia	OECD	Organization for Economic Cooperation and Development
DE	Domestic Extraction	PSNP	Productive Safety Net Program
DFID	UK's Department for International Development	PTB	Physical Trade Balance
DMC	Domestic Material Consumption	RR	Roundup Ready
EC	European Communities	RSB	Roundtable of Sustainable Biomaterials
EIA	Ethiopian Investment Agency	SPSs	Sanitary and Phytosanitary Measures
EIA	Environmental Impact Assessment	t	Metric Ton
EJO	Environmental Justice Organizations	TBT	Technical Barriers to Trade
ERPFD	Ethiopian Peoples' Revolutionary Democratic Front	TE	Tariff Equivalents
EU	European Union	UNCTAD	United Nations Conference on Trade and Development
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database	USAID	United States Agency for International Development
FSC	Forest Sustainability Certificate	VAT	Value Added Tax
FW	Fresh Weight	WRM	World Rainforest Movement
GATT	General Agreement on Tariffs and Trade	WTO	World Trade Organization
GDP	Gross Domestic Product	WWF	World Wide Fund for Nature
GM	Genetically Modified		

The ISO 4217 standard is used for the currency codes (e.g. USD for US dollar or BRL for Brazil real).

Foreword

Conflicts over resource extraction or waste disposal increase in number as the world economy uses more materials and energy. Civil society organizations (CSOs) active in environmental justice issues focus on the link between the need for environmental security and the defence of basic human rights.

The EJOLT project (*Environmental Justice Organizations, Liabilities and Trade*, www.ejolt.org) is an FP7 Science in Society project that runs from 2011 to 2015. EJOLT brings together a consortium of 23 academic and civil society organizations across a range of fields to promote collaboration and mutual learning among stakeholders who research or use Sustainability Sciences, particularly regarding aspects of ecological distribution. One main goal is to empower environmental justice organizations (EJOs) and the communities they support, which bear an unfair share of environmental burdens, in defending or reclaiming their rights. This will be done through a process of two-way knowledge transfer, encouraging participatory action research and the transfer of methodologies with which EJOs, communities, and citizen movements can monitor and describe the state of their environment and document its degradation. The transfer is designed to enable learning from other experiences and from academic research and to provide arguments in combatting the growth of environmental liabilities or ecological debts. Thus, EJOLT will increase EJOs' capacity to use scientific concepts and methods for the quantification of environmental and health impacts, increasing their knowledge of environmental risks and of legal mechanisms of redress. On the other hand, EJOLT will greatly enrich research in the Sustainability Sciences by mobilising the accumulated 'activist knowledge' of the EJOs and making it available to the sustainability research community. Finally, EJOLT will help translate the findings of this mutual learning process for the policy arena, supporting the further development of evidence-based decision making and broadening the information base. The focus is on the use of concepts such as ecological debt, environmental liabilities, and ecologically unequal exchange in science and in environmental activism and policy-making.

The overall **aim** of EJOLT is to improve policy responses to and support collaborative research on environmental conflicts through capacity building of environmental justice groups and multi-stakeholder problem solving. A key goal of the EJOLT research has been to understand the links between increased societal metabolism (in terms of energy and materials) and resource extraction and waste disposal conflicts in order to address the following pressing concerns:

What are the causes of increasing ecological distribution conflicts at different scales and how can such conflicts become positive forces in achieving greater environmental sustainability?

International physical trade of agricultural products was traditionally low compared to the trade in fossil fuels, metals, and highly processed commodities. The reasons behind were in part the comparatively low prices attainable for those agricultural products traded in bulk and the relative ubiquity of biomass as a resource. In contrast, most non-renewable resources are point resources that are much more concentrated in specific regions than in others, with trade in these materials being a prerequisite for their availability in many countries. From 1960, global trade in agricultural products grew by factor 6 while production only grew by factor 2. For several crop types, growth was even more pronounced: Exports of oil-bearing crops, for example, grew by factor 10 while production of this crop type grew by factor 5. Nearly all new land areas that were brought into production after 1986 were used to produce export crops (Kastner et al., 2013).

From a regional perspective, this export orientation can be observed to be most pronounced in Latin America, in some Southeast Asian and Eastern European countries, and (to a far lower degree) in Sub-Saharan Africa. The revenues generated by exports are commonly required to finance imports. In some cases, they were partly distributed among the poorer segments of the respective populations through social welfare programs, such as the 'Bolsa Família' in Brazil and other programs in Latin America. On the other hand, within the last four years, the EJOLT project collected 218 cases documenting a link between biomass extraction and land use conflicts. This report aims to reveal the biophysical conditions and structural drivers of these conflicts and thus to identify conflict potentials that result from the dominant model of industrialized agricultural production (Hamilton, 1993).

Chapter 1 of this report offers a general description of the environmental, political, and economic development within which agricultural production occurs. Theories and methods, which have proven useful in addressing socio-environmental conflicts driven by different claims on the land system, are also presented in this chapter.

The case of the expansion of industrial tree plantations in the global South for the biomass demands of industrialized regions, analysed by Winnie Overbeek and colleagues from the World Rainforest Movement, illustrates this framework by describing one increasing claim on the land system that – *ceteris paribus* – reduces fertile land for other purposes.

Chapter 2 summarizes international trade policies that have driven agricultural production and trade flows since the 1950s. We elaborate the functioning and influence of the World Trade Organization (WTO) and investigate how its policies have triggered changes in agricultural patterns in many parts of the world.

Chapter 3 contains the empirical section of this report and analyses patterns of food import dependency at the country level in 2010. In an export-oriented agricultural production system, we consider the degree of food import dependency

coupled with the lack of access to financial capital to be a systemic driver of socio-environmental conflicts.

In conclusion of the report's section on global patterns, an analysis of the vulnerability of food systems is presented at the country level for rice, maize, and wheat in **chapter 4**.

Following the global analysis of agricultural production and trade, we present three country level case studies in **chapter 5**. While Indonesia and Paraguay are already important providers of agricultural products on the global market, Ethiopia is currently entering a phase of development leading toward greater export orientation.

Chapter 6 provides a synthesis from the global analysis and the country case studies. This synthesis highlights the fact that smallholder inclusion in agricultural development often contrasts with the increasing land concentration that can be observed in the agricultural sector.

1

Introduction

1.1 Biomass and land: hosting, feeding, and fueling humanity

Industrialization is as much a metabolic process as it is an economic, political, and social transformation. As an economy industrializes, agriculture tends to lose importance in terms of employment and income. The resource base shifts from one dominated by biomass to one dominated by minerals (Krausmann et al., 2008b). Nonetheless, all economies, whether industrialized or not, continue to require inputs of biomass for the direct and indirect consumption of their population and often also in order to meet final demand elsewhere through exports.

Biomass is the sum of recent, non-fossil organic material of biological origin, i.e., derived from living (plants) or recently living organisms (e.g., meat). Despite the dominating importance of non-renewable resources in industrial societies, plant-based biomass still accounted for more than one third of global material consumption in 2010 (Schaffartzik et al., 2014). The most essential human use of biomass is the provision of food for humans and of feed for domesticated animals, and despite some advances in the production of artificial food, biomass for food and feed is not substitutable. Biomass is also used as raw material in industrial processes, for construction (wood), manufacturing of clothes, pulp and paper, and a broad variety of other purposes.

Next to these purposes, biomass is still the most important energy carrier for a large part of the population in low-income countries (Krausmann et al., 2008). During recent years, another demand grew massively, mostly in the highly industrialized world. Agrofuels¹ contain energy from living organisms, mostly plants. Agrofuels are produced in direct or indirect competition with food, feed crops or natural lands, thus increasing human pressure on the land system. Currently, around two-thirds of the terrestrial surface of the earth are used by humans in order to produce biomass (Erb et al., 2007; Lambin and Meyfroidt, 2011). Only a relatively small share of one-fifth of the global land is still regarded as 'wilderness' and is mostly to be found in the very northern parts of the

Agrofuels are produced in direct or indirect competition with food, feed crops or natural lands, thus increasing human pressure on the land

¹ The term 'agrofuels' (and hence agrodiesel) is used here to underline the focus on large-scale agricultural production of biofuel feedstock. When we use the term biofuel, we refer to the official use of this term, such as *biofuel policy* or *EU biofuel mandate*.

Americas and Russia, although there are still some areas in the tropical zone that are considered as wilderness (Sanderson et al., 2002)². However, whether these areas are still without human interference is debatable.

Between 1960 and 2010, global biomass consumption more than doubled in absolute terms causing per capita availability of biomass to remain almost constant at around 3 tons per person per year despite shifts from biomass-based energy such as firewood to fossil fuels (Schaffartzik et al., 2014). Alongside changes in the structure of global biomass production, the overall growth of the resource hunger of the global economy has pushed extraction frontiers further into areas that were previously beyond the reach of industrial extraction, production, and transport infrastructure.

Landscapes outside of the densely populated centers of global capitalism have traditionally been seen as underused and ripe for societal use. Making an analogy to the depictions during colonial times, Wylie (2007) sums the current land rush up as follows

... non-European landscape is equally simultaneously pictured as natural and pristine, as untouched and untransformed. This symbolic erasure of other possible histories of land occupation of course parallels more literal processes of imperialist land appropriation and indigenous repression... It also ... tends to 'empty' the landscape, just as much as cartography advances a blank space of the unknown before itself. In this way, as untouched nature, the landscape is pictured as ripe for settlement and colonisation (Wylie, 2007: 133, cited in: Scoones et al., 2014: 5).

Land supports a multitude of functions for the existence and reproduction of all sorts of forms of life, including human societies (Haberl, 2014). The functions for human societies are: Services that range from supporting systems such as soil formation and genetic diversity to provisioning services in the form of food, fuels, and fibres, regulating services such as carbon sequestration, or cultural services in the form of recreation, sacred groves, and inspiration. However, through the maximisation of one specific form of land use, competition with other uses and related conflicts may arise. For example, the extension of areas used for the production of energy crops may reduce the area available for smallholder food production or biodiversity conservation or may cut or block corridors that are used by transhumant pastoralists (Fritsche et al., 2010; Smith et al., 2010).

In an ever more globalized world, increased interactions over long distances shape global land use and increase land use competition. EU biofuel mandates

² It is important to mention that the term 'human interference' is not a straightforward description of the way humans interact with their environment. The dominant (Western) view describes a vision of humans separated from nature, with humans dominating, changing, and impacting their natural environment. On the other hand, there are still many (indigenous peoples') cultures alive - although under severe threat - where other visions of a co-existence between humans and nature in which humans are considered an integral part of nature exist or are being reinvented (e.g., the *buen vivir* concept in Latin America).



are a poignant example, as they create a growing demand which may shift agricultural production in third countries (especially in Africa, Asia, or Latin America) away from food production for domestic use towards the production of agrofuel feedstocks that are exported to the EU (Liu et al., 2013). Biofuel mandates can additionally trigger indirect land use change when oil crops previously available for food production are used as agrofuel feedstocks, causing the expansion of oil crops elsewhere. As this example illustrates, the growth in social metabolism in the industrialized and industrializing world regions is a major driver of the expansion of resource extraction. This in turn increases the pressure on land area.

Beyond food biomass

There is a large body of academic interdisciplinary and non-academic literature on the societal use of biomass for food, feed, fibre, and energy production and the effects such uses have across scales from the local to the national and the global. This study draws mainly on concepts from the transdisciplinary collaboration of the scientific fields of social ecology, land use science, and food systems research, together with NGOs and EJOs concerned with the expansion of industrial tree plantations and small farmers' struggles for community-controlled and biodiversity-based food systems.

We use the concepts of colonization of ecosystems, food security, food sovereignty, and food regimes to position and discuss our empirical findings on biomass flows. Biophysical patterns of biomass extraction and trade and the related forms of land use at the national, supranational or global level have been analysed thoroughly (Kastner et al., 2014; Krausmann et al., 2008a, 2008b; Schaffartzik et al., 2014; Steinberger et al., 2010; Haberl et al., 2007; Erb et al., 2009; Krausmann et al., 2013, 2009). These studies centre on biophysical flows related to biomass use, although only a few touch on the social, economic, and political contexts connected to the biophysical patterns analysed.

One aspect that is well studied concerns patterns of biomass use for human consumption. Out of the four aspects of food security, i.e., availability, access, stability, and utilisation (Ericksen et al., 2009), the studies mentioned above focus most on food availability. This focus is mainly due to the availability of biophysical data at the national level, including data on biomass trade. While the concept of food security provides fruitful links for interdisciplinary work, there is criticism of the strong focus on food availability at the cost of other relevant questions, such as access to and utilisation of biomass across scales.

The EJOLT work package 5 (biomass and land conflicts) is centred on the following question: Who owns what land and what does owning or leasing land actually mean?

In our globalised economy, with its increasing land and food commodity speculation, the question of land ownership and access has become a matter of life-or-death for millions of people in the global South.



Food sovereignty describes the right of people to decide which food system they want to have.

In order to operationalize this rather broad question, we discuss empirical findings on the development of biomass extraction and trade from 1950 to 2010 and examine how these trends are linked to food security and sovereignty, as well as to the theory of food regimes. Biomass extraction, and to a large extent biomass trade, have undergone significant changes in composition and absolute mass flows over these years. There is an indication that some of these trends have induced socio-environmental conflicts. In order to identify and trace the drivers for these conflicts, we have linked biomass extraction and trade to food import dependency, which we consider a proxy for food sovereignty.

The food sovereignty's biophysical realities

Food sovereignty, a term coined by members of the social movement of peasants, 'La Via Campesina' in 1996, describes the right of people to decide which food system they want to have (Chaifetz and Jagger, 2014; Laroche Dupraz and Postolle, 2013). Most proponents of food sovereignty put the peasant communities and populations who produce, distribute, and consume food at the core of food systems and policies, rather than the corporations and market institutions that dominate the global food system. Some scholars such as Miguel Altieri place the concept on a more general level, defining food sovereignty as *the right of each nation or region to maintain and develop their capacity to produce basic food crops with the corresponding productive and cultural diversity* (Altieri, 2009). This definition of food sovereignty includes political, economic, and social aspects, while biophysical aspects remain underrepresented. Numerous papers and books have been published on various aspects of food sovereignty, such as community-building, access to seeds, community supported agriculture, slow food movements, and other food sovereignty movements (see Chaifetz and Jagger, 2014 for examples and more references).

What is clearly missing is an investigation of biophysical flows (including trade) related to food sovereignty (Burnett and Murphy, 2014; Ng and Aksoy, 2008), as well as of the historical development of food regimes themselves. To understand the role which food import dependency plays in global biomass trade patterns, in this study, we use the degree of food import dependency (share of imports in relation to domestic extraction (DE) of the most important cereal using material flow accounting (MFA) methods (EUROSTAT, 2012)) and the level of economic wealth (measured as GDP/cap) as a proxy for access to (market) food on a country-wide level. We aim to provide an empirical link between the concepts of food security and food sovereignty in relation to biomass trade. We have distinguished eight country clusters based on the countries' economic wealth and the particular form and degree of their integration into global food trade. We consider these characteristics of biomass trade as potential contributing factors in resource conflicts between different societal groups.

The following report provides a biophysical overview of the evolution of global biomass flows from 1950 to 2010 and links these results to questions related to food import dependency. To provide an epistemological background, we first summarize the theory of food regimes (Friedmann, 2009; Friedmann and McMichael, 1989; McMichael et al., 2007; McMichael, 2011). This theory



differentiates between three food regimes since the end of the 19th century which shape and are shaped by global patterns of biomass extraction and trade. There is increasing evidence that each of these global patterns is related to specific forms of food insecurity. The global food crises of 2008 and 2011, for example, demonstrated the vulnerability of food-import dependent, low-income nations to food-price spikes and export restrictions. Following the introduction of food regime theory, we discuss the impact of the spread of industrial tree plantations (ITPs) in the global South, before we analyse global patterns of biomass extraction and exports. We then provide a debate on major developments in biomass exporting nations, such as the focus on extractivist economies in Latin America or South-Eastern Asia, as well as on large-scale land deals in African countries.

Food regime theory describes capitalist accumulation in global food production and trade.

1.2 Colonization of ecosystems and food regime theory

The manner in and extent to which a society colonizes ecosystems is decisive for its internal organization. Colonization of ecosystems can be defined as the purposeful human intervention into these ecosystems with the aim of changing and maintaining them in a form that is more useful for society than it would be without these alterations (Fischer-Kowalski et al., 1997). Since society is not a single-minded actor, different groups within society may have competing interests when it comes to the colonization of a specific ecosystem. Peasant farming and industrial monocropping activities, for example, are both forms of ecosystem colonization with benefits and negative impacts for different groups. In general, agriculture and forestry are two prominent examples of societal colonization activities. Forms of subsistence can be distinguished by the colonization strategies through which metabolic needs are met: hunters and gatherers, agricultural societies, and industrial societies (Sieferle, 1997). This distinction of sociometabolic regimes was developed for historical analyses and can also be applied to contemporary societies. For this report, it serves as a background for the country cluster analysis.

The three different food regimes which Friedman and McMichael distinguish in the period since 1870 (Friedmann and McMichael, 1989; McMichael, 2011) all occur in the context of a transition to the industrial sociometabolic regime in different countries and/or world regions. The first food regime (1870–1930s) was characterized by imports from largely agrarian tropical regions to industrialized Europe (most notably to the UK). During the second food regime (1950s–70s), which Friedmann and McMichael define to have emerged with the global Marshall plan and after the decolonisation of many countries in Africa and Asia, surplus flows from the industrialized US were re-routed to the US dominated ... *informal empire on the strategic perimeters of the Cold War* (NZPA, 2014). Under the third food regime (late 1980s until today), defined by a set of new international trade conventions, new countries (e.g., Brazil, China) were integrated in the network of global food production and trade, especially through the increasingly fragmented supply and use chains for animal protein. Simultaneously, the supermarket 'revolution' for the global upper-and middle-class occurred and urbanization (with

inter- and subnational migration from rural areas to cities and often into informal urban settlements) rapidly progressed as small-scale farming became less viable, especially in the global South (McMichael, 2009). This urbanization entails a transition from the agrarian sociometabolic regime which still dominates rural areas in many countries to the industrial metabolic regime in cities (Fischer-Kowalski et al., 2014).

In the following, the main characteristics of the three food regimes are discussed in the context of changing society-nature interaction. Land grabbing and neextractivism as currently dominant phenomena in the global food system can be understood as expressions of this changing interaction which are in turn linked to resource competition, scarcity, and environmental conflict.

McMichael classifies the 20th century as a continued assault on farming systems across the world where a model of 'agriculture without farmers' is imposed (McMichael, 2013b). According to McMichael (2013: 3), *the central agro-exporting principle of the latest food regime has served to displace producers by violent processes of land grabbing on the one hand, and market dumping on the other*. Under a capitalist economic system, land grabbing can be understood as a necessary precursor if land accumulation is achieved by dispossession (Harvey, 2005). "Market dumping"³ started with the second food regime after World War II and systematically undermines smallholder farming through both Southern debt management and Northern subsidies (McMichael, 2013b).

1.2.1 The first food regime (1870–1930s)

During this expansive regime of the late 19th century and early 20th century, current structures of globalized food production (including large-scale plantations) and international biomass trade were established that continue to shape conflicts around the world today.

The first food regime falls into a period that is sometimes referred to as that of 'new imperialism' (e.g., Harvey, 2005) and is characterized by colonial expansion into regions under the agrarian sociometabolic regime and the simultaneous industrialization of imperial centres. It is no coincidence that the first food regime falls into the same period during which the steam engine came into wider use and enabled the production of high-grade steel to build large transport infrastructure. For the first time, global trade included not only highly priced luxury goods (such as spices and rare metals) but also basic staples such as grains and livestock which European countries imported from their colonies (McMichael, 2009).

In order to feed the growing landless working class in Europe, large areas abroad were claimed for food production. Agricultural systems dominated by monoculture production were imposed in the colonies, often eradicating existing food

³ McMichael defines "market dumping" as dumping of northern foodstuffs in southern markets characterized the 1980s-90s, and this has extended in the twenty-first century to the experience of Eastern European countries joining the EU and being subject to German and French supermarket colonization (McMichael, 2013: 3).



production systems and appropriating a large share of the ecological resources in these areas (McMichael, 2009). This expansion was often contested and led to conflict with the colonies' inhabitants (Woodroffe et al., 2005).

1.2.2 The second food regime (1950s–70s)

The second food regime, or the post WW II food regime (Fairbairn, 2008), was rooted in the organization of the world economy under US hegemony. Friedmann and McMichael (1989) define two basic, yet contradictory relations of production and consumption that coined the second food regime. First, the extension of the state system in former colonies in Africa and Asia that destroyed the basis for colonial specialization as it still happened in the first food regime. The integration into the second food regime proceeded on two new fronts, imports of wheat from the US and the decline of markets for their own tropical exports. These relations created dependence on the one hand, and on the other hand new markets for the US. Second, the industrialization of agriculture (i.e., the Green Revolution) created an intrasectoral integration of agricultural relations across national states

With the Green Revolution, growth in agricultural production output was obtained by increasing yields through higher inputs (of energy, water, fertilizers, and pesticides) into production. The Haber-Bosch process, an extremely energy-intensive technique to capture nitrogen from the air in order to be able to use it as agricultural fertilizer, made it possible to bypass previous nutrient limitations in agriculture. Together with other developments of the Green Revolution, this triggered massive yield increases in the US (and a bit later in Europe, too) during the second half of the 20th century. Next to the application of fertilizers and pesticides (Pimentel et al., 1973; Tilman et al., 2002; Smil, 2001), the development of modern crop varieties (Evenson and Gollin, 2003) was an important component of the Green Revolution. Overall, agriculture began to depend more heavily on direct and indirect inputs of fossil energy. From the industrialized and industrializing countries, the Green Revolution was spread to the global South.

As global agricultural production grew, 'food self-sufficiency' dominated the discourse on food sovereignty during the second food regime (Fairbairn, 2008). Nonetheless, increased agricultural output was often dedicated not only to domestic consumption but also to trade and a zero-import objective was neither desirable nor attainable for most countries. At the same time, agribusiness strengthened its transnational linkages through a stronger international division of labour and a re-integration of single production steps into integrated (although globally fragmented) supply chains (e.g., the transnational animal protein complex linking crop production and livestock husbandry) (McMichael, 2009). Overall, the second food regime was characterized by massive increases in agricultural yields and an expansion of croplands (Ramankutty and Foley, 1999) leading to strong growth in agricultural output. Due to rapid population growth, increased biomass extraction did not translate into higher per capita availability (Krausmann et al., 2009, Schaffartzik et al., 2014).

1.2.3 The third food regime (1980s – today)

The third food regime is also referred to as the ‘corporate food regime’ and began in the 1980s as neoliberal policies were implemented which sought to liberalize international trade by removing perceived trade barriers. Transnational institutions such as the World Bank and the International Monetary Fund (IMF) were instrumental in attaining the implementation of these policies which were intended to boost international trade and increase (market-driven) food security. Transnational animal protein chains integrated new regions through a further division of labour (e.g., through the production of soy for animal feed in Latin America and its export to countries with large and/or growing livestock sectors in Europe or Asia). While the number of countries thus involved in global food production increased, food provisioning and consumption also changed fundamentally. The global transition towards a market-oriented food regime is referred to as the ‘supermarket revolution’ (Reardon and Timmer, 2014) and provided access to fresh fruits, vegetables, and animal products to those with sufficient monetary funds.

The increasing marketization of food provisioning not only favours more affluent segments of the global population, it also has additional social and environmental impacts. For example, as large-scale agriculture displaces small-scale farming, the increased market-orientation of food production contributes to urbanization and rural exodus, or to increasing concentration of supply. The latter may increase market prices due to a lack of competition between suppliers.

Large-scale agriculture and the associated standardisation of production may be associated with the loss of seed variety. McMichael (2009) considers this emerging global food/fuel agricultural complex as creating tension with various forms of localism, such as the slow food movement or diverse food sovereignty movements.

During the third food regime, movements against the dominant agricultural model began to emerge, making claims to food sovereignty, locally grown food, community supported agriculture, and small-scale organic production. Chaifetz and Jagger (2014) describe these movements as an ‘industrial detox’ against trade-driven global food markets.

1.2.4 Food regime crisis and conflicts

Global biomass production has undergone massive changes since WW II. Rudel et al. (2009) show that while significant increases in global average crop yields were reached, this intensification was also accompanied by a substantial expansion of croplands, by 32% between 1963 and 2005. Due to population growth, the increasing production of biomass does not translate into growing metabolic rates (i.e., per capita availability of biomass) – instead, these rates decreased slightly during the second half of the 20th century. However, the picture has been changing since the beginning of the 21st century, since when per capita rates slightly increase (Schaffartzik et al., 2014).



Driven by a growing industrial use of biomass (e.g., for agrofuels) and by changing dietary patterns (e.g., meat consumption of growing middle classes), biomass extraction and trade are likely to continue increasing in the future (Erb et al., 2012a; Odegard and van der Voet, 2014). Business, policy, and research interest thus coincides in increasing biomass production through intensification, closing yield gaps (Mueller et al., 2012) or through the expansion of agricultural activities into land considered unused or underused (Carvalho et al., 2002; Young, 1999). In order to avoid the negative environmental and social impacts of intensification, a growing body of research seeks to find ways to sustainably intensify land use (Beddington, 2010; Godfray et al., 2010a; 2010b). Other studies make claims that there are vast underused land areas that carry huge potential for growing drought-resistant energy crops, mostly in dry regions of Sub-Saharan Africa, but also in Latin America (Jumbe et al., 2009).

Despite the large body of research on improving biomass production, McMichael (2013) underlines the inability of the current industrial food regime to significantly reduce global hunger. The global food crises of 2008 and 2011 resulted from a dangerous simultaneous occurrence of supply shortages (caused by both natural conditions such as droughts and man-made conditions such as decreased grain stocks) and demand surges (caused by the emergence of agricultural futures on the stock markets and of new industrial biomass uses such as agrofuel production). Global trade as a balancing factor failed, as many important grain exporters imposed export bans to secure the food supply for their own population. The consequences of export bans were especially felt by food import dependent countries (McMichael, 2013b).

By mid-2009, almost one-sixth of humanity (about 1 billion people) were considered at risk of hunger or malnutrition (McMichael, 2009). Despite this alarming signal, proposed solutions to combat hunger remain one-dimensional, as Brunett and Murphy (2014, 2) note: *The Agreement on Agriculture prescribes a model for agriculture that has basically only one dimension: increasing agricultural production for exports, importing what cannot be produced without tariff protection or subsidies to producers.* Madeley stated already in 2000 (54-55) that *while 90 percent of agricultural expenditures in Latin America were devoted to food crop research in the 1980s, during the 1990s 80 percent focused on export crops.* It is very likely that this trend has continued in the 21st century.

In light of these multiple demands for land, the current development of the land-use system is characterized by a continuous expansion and land-use intensification. This partially entails a shift in food production for global markets to the global South, where costs and environmental regulations are often lower than in the global North (see **Box 1**). The resulting challenges for smallholders are twofold: First, not to lose control over or access to land and second, to manage the transformation of their farming practices which often accompanies the integration into global value-chains. This, in the end, is very likely to produce a similar outcome to the green revolution in the global North, where the industrialization of agriculture reduced the amount of farmers significantly. If these people are able to secure an income in other sectors than agriculture, at least their



livelihood are possibly secured, while it may also can trigger an alienation from their livelihood. In world regions where smallholders still provide most of the calories for the respective populations, this transition may be conflictive and not without victims. In order words, we can resume it with John Madeley's findings of the analysis from 27 impact assessments on the effects of trade liberalization. He stated that *WTO-style 'free trade' benefits only the rich, while making the poor more vulnerable to food insecurity* (Madeley, 2000).

Box 1 Forest restoration credits in Brazil

In 2012, Brazil adopted a revised Forest Code. The forest legislation retains the requirement that land owners maintain a certain percentage of the forest intact. The size of this intact area depends on the forest type. In comparison with the previous legislation, the requirements have been reduced along streams, for example. The more fundamental change however was that the 2012 revision of the Forest Code requires that land owners who in the past destroyed more land than was allowed, would have to restore the land within a certain number of years. Previously, if they had not restored the land, they would have risked a fine (though there was little enforcement) and above all, losing eligibility for rural credit options, thus borrowing money would become more expensive for them. The revised 2012 Forest Code introduced the option that the land owner buys a 'forest restoration credit' (CRA), as an alternative to the land owner restoring the illegally cleared forest on his own land. The credit is sold as promise that someone else somewhere else has protected more of the same type of forest than was necessary under the Forest Code, and therefore has made up for the excess destruction of forest committed by the buyer of the CRA. These CRAs are now traded, among others, on the environmental exchange in Rio de Janeiro, the Bolsa Verde do Rio de Janeiro (BVRio). This enables land owners in places where land prices are high and where destructive practices are lucrative to continue with business as usual by buying cheaper offset 'forest restoration credit', including from regions where the threat of deforestation is much lower (WRM 2014d, 27)

1.3 Feedstock for the industrial biomass metabolism as another demand upon the land system⁴

The following part of this report summarises the work that the World Rainforest Movement (WRM) has contributed to EJOLT WP5 on land use conflicts. WRM has extensive expertise in the global spread of industrial tree plantations (ITPs), which supply biomass that is not used for food purposes but that is mainly utilized in the global North for e.g., rubber products or as pulp for paper production. The expansion of ITPs places a further demand on services from the land system which increases competition with other land uses, such as crop production or natural forests. The massive expansion of ITPs, especially in countries in the global South such as Brazil, Uruguay, Indonesia or Chile, is often closely related to conflicts, as the following chapter shows.

Since the 1960s and 1970s, ITPs have been expanding significantly on a global scale. Such plantations are defined here as large-scale monocultures of intensively-managed and equal-age trees. Their expansion has been pushed for by corporations and consultancy companies, with the support of financial institutions and national governments (Overbeek et al., 2012).

⁴ Chapter 1.3 is contributed by Winnie Overbeek from World Rainforest Movement (WRM).

Over the past decades, ITPs have expanded more in the global South than in the global North. The FAO does not yet have explicit figures for ITPs but we consider the production of timber as a reasonable proxy for tree plantations (**Figure 1**). While the largest share of ITP products was traditionally produced in Northern America and Western Europe, Brazil, Chile, China, and Indonesia now rank among the top producers of timber and other forestry products. In the global South, ITP monocultures are mainly exotic trees like fast-growing eucalyptus, pine and acacia species, most often planted in short rotation cycles of about 6 to 12 years, when destined for export-oriented industrial processes that produce pulp and paper. Another important tree cultivated in ITPs in the global South is the rubber tree, with its production purpose mainly related to tyres for motor vehicles (Overbeek et al., 2012). For timber, **Figure 2** reveals that most world regions have actually been net exporters in the last decade, while large parts of Asia and Northern Africa are net importers of timber.

Fig. 1
Domestic Extraction of timber in million tons (Mt) of fresh weight (FW) from 1980 to 2010 10year resolution for 10 world regions. Please note that Northern America is depicted on the secondary y axis
 Data Source: Schaffartzik et al., 2014

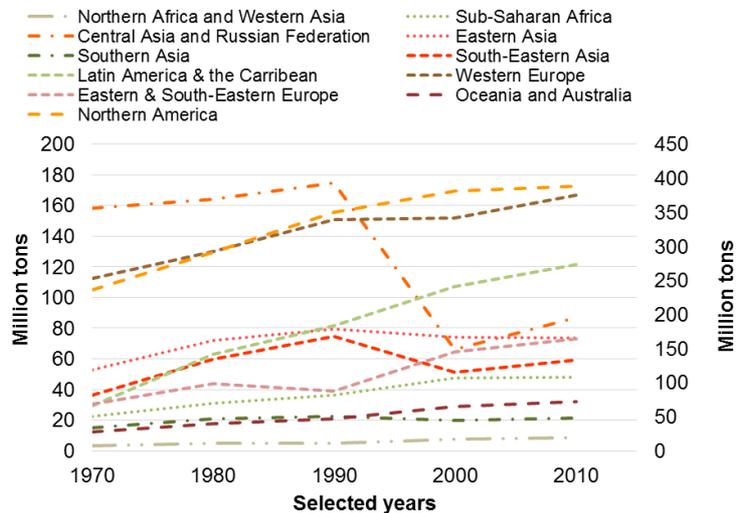
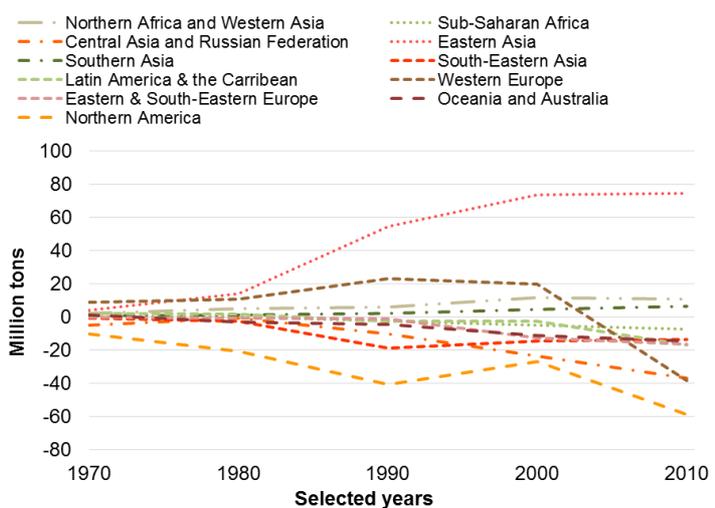


Fig. 2
Exports of timber in Mt of FW from 1980 to 2010 10year resolution for 10 world regions
 Data Source: Schaffartzik et al., 2014



The expansion of ITPs in the global South has become more attractive for corporations when compared to the global North for a number of reasons: the availability of cheap land and labour, less rigid environmental legislation, and a far higher productivity rate. In countries like Brazil, Chile, Uruguay, and Indonesia,

corporations can obtain productivity rates of 20-44 m³/ha/year with eucalyptus hardwood (Overbeek et al., 2012). An area planted with spruce and pine or typical pulpwood species like birch trees in countries in the North like Finland and Sweden, produces much less with a typical productivity rate of 2 m³/ha/year. Nonetheless, these economies are heavily based on so-called 'forestry products' (Gartland et al., 2003).

For rural communities in the global South in the expansion areas of ITPs, such plantations have become a major threat to their livelihoods and the biodiversity upon which they depend. Plantation corporations have a preference for flat, fertile lands, because they can obtain the highest productivity rates, mechanize production, and thus obtain higher profit rates. But these lands are also the territories of indigenous peoples, traditional or peasant communities, who practice small-scale agriculture in such fertile areas. These communities also obtain benefits from the biodiversity present in forests and other biomes on which their livelihoods depend. Therefore, the land grabbing process and environmental destruction provoked by ITPs have resulted and continue to result in incalculable losses for and bitter conflicts with communities (Overbeek et al., 2012).

The impact of ITPs on food sovereignty is a main concern. For example, when confronted with the invasion of large-scale monoculture tree plantations on their territories, Brazilian peasants have protested against such plantations with the slogan: "*But nobody eats eucalyptus*".

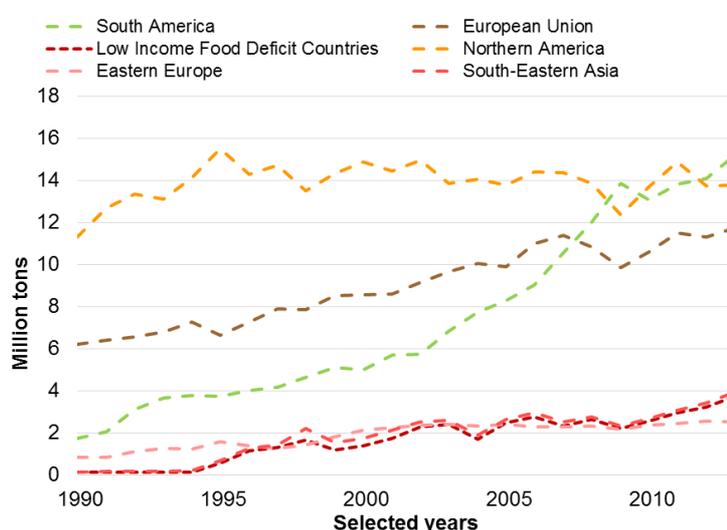
Data on industrial tree plantations should be treated with caution. They are based mostly on FAO data, which has its limitations (Overbeek et al., 2012). The data that are available, however, show a strong increase of ITPs in the past few decades in the global South, from about 13 million hectares at the end of the 1980s to about 45 million hectares in 2010. Eucalyptus is the main tree crop being cultivated. Eucalyptus plantations occupied 16-19 million hectares in 2010 and were concentrated particularly in South America and especially in Brazil, where eucalyptus plantations covered 7 million hectares in 2014. The main companies operating in Brazil are the Brazil-based Fibria and Suzano and the Swedish-Finnish pulp and paper giant Stora Enso. Rubber comes second on the list of tree crops, with 10 million hectares of plantations in the global South. Most rubber plantations are located in Asia and are managed mainly by transnational companies like Bridgestone (Japan) and Michelin (France). The third and fourth most widespread tree crops are acacia and pine, again species of relevance for pulp production. Acacia is mainly planted in Indonesia by companies like Asian Pulp & Paper (APP) and APRIL, and pine plantations are promoted for example in Chile by the Chilean-based companies Arauco and Forestal Mininco (Overbeek et al., 2012).

As a consequence of this plantation expansion, huge pulp mills were built in countries like Brazil, Uruguay, Chile, and Indonesia. Most of the pulp mills that have been built in the global South use chemical production processes, resulting in so-called chemical wood pulp. Between 1980 and 2012, global chemical wood pulp exports increased by 252% from 18.1 million tons to 45.9 million tons (**Figure 3**). Most of this pulp production is destined for paper and paperboard mills in

China, although most of the production there is in the hands of transnational companies from the global North (Overbeek et al., 2012).

Because of the expansion of pulp mill capacity in Southern countries, both their share in and the total amount of pulp exports increased significantly in the period from 1980 to 2012. South America shows the highest increase in chemical wood pulp exports, from 1.3 million tons in 1980 to 14.1 million tons in 2012. In 2012, Brazil (8.5 million tons), Chile (4.3 million tons) and Uruguay (1.1 million tons) were the main exporters. In Southeast Asia, exports also increased strongly, from virtually nil in 1980 to 3.4 million tons in 2012, most of which came from Indonesia (3.2 million tons in 2012). In the same period (1980-2012), chemical wood pulp exports from Sweden, one of the traditional pulp producing and exporting countries in Europe, remained stable at about 2.6 million tons while Finnish exports increased relatively little from 1.7 to 2.4 million tons (FAOSTAT, 2014).

Fig. 3
Exports of chemical wood pulp from 1990 – 2013 in Mt of FW for 5 world regions and 1 country grouping (Low Income Food Deficit Countries)
Data source: FAOSTAT, 2014



Globally, the ITP area for pulp and paper production is projected to increase further in the coming years, when the sector is expected to recover from the period of stagnation that started with the financial-economic crisis in 2008. Industry data indicates that the recovery is already underway, especially in the highly productive ITP countries. In Brazil, for example, chemical wood pulp exports started to increase again from 8.5 million tons in 2012 to 9.5 million tons in 2013, while Indonesian exports increased, too, from 3.2 to 3.7 million tons in the same period (FAOSTAT, 2014).

In April 2014, all Brazilian associations working with products from industrial tree plantations announced the creation of the organization Brazilian Trees Industry ('Indústria Brasileira de Árvores – Ibá') which aims to increase the size of Brazil's ITPs from about 7 million hectares today to 14 million hectares in 2020, thus doubling the total plantation area (Ibá, 2014). Meanwhile, in Indonesia, ITPs are also expected to expand, from about 9 million hectares in 2013 to 25 million hectares in 2020. The largest increase is projected to come from the expansion of oil palm plantations (also see **Chapter 5.2** of this report) and industrial tree plantations for export pulp production are also expected to expand (Overbeek et al., 2013). The Brazilian company Suzano opened a new pulp mill in Maranhão



Northern investment funds increasingly invest in ITPs, the marketing of ITPs as carbon sinks attracts CDM credits, driving the further expansion of ITPs in the global South.

(Brazil) in March 2014, with a production capacity of 1.5 million tons of chemical wood pulp per year (Suzano, 2014). Meanwhile, a new mill run by APP with a 2 million ton capacity is currently being built on Sumatra (Indonesia) and is expected to start operations in 2016 (KSH Consulting, 2014). In Uruguay, Montes del Plata's (a joint venture by Stora Enso and Arauco) new pulp mill started operations in September 2014, with a 1.3 million ton capacity (Espectador.com, 2014).

1.3.1 New drivers of expansion

In addition to expanding their plantations, ITP companies have also been exploring new opportunities and markets. Especially after the financial-economic crisis, since 2008, mainly Northern investment funds have invested in lands managed by ITP companies because their holdings are considered a secure investment for these funds. The Brazilian company Fibria, for example, sold about 210,000 hectares of their land holdings to the investment group Parkia Participações in 2013. The sale, worth BRL 1.65 billion (approximately USD 660 million), was announced as beneficial for Fibria. On the one hand, it improved cash flow to pay back accrued debt while being able to maintain access to timber. On the other hand, after the end of the 24-year contract duration, Aracruz will have a preferential option to buy back the lands (E&N Negocios, 2013). Other investment funds, including a fund owned by Harvard University in the US, are increasingly investing in ITP areas in Brazil, Argentina, and Uruguay (World Rainforest Movement, 2014a).

Another related trend to generate additional income from plantations involves marketing ITPs as carbon sinks and selling so-called CO₂ or carbon credits to polluting countries or industries. The eucalyptus tree planting project of the Brazilian company Plantar, for example, succeeded in having their tree planting approved as a Clean Development Mechanism (CDM) project. Carbon credits are generated and sold from thousands of hectares of eucalyptus ITPs from which charcoal is produced. Charcoal is presented as a 'renewable energy' source for a pig iron industry that mainly produces the raw materials for cars, trucks (Overbeek et al., 2014), and energy infrastructure.

Another promising new market opportunity for ITP companies is the transformation of plantation wood into wood pellets as a form of 'renewable energy' and as a newly created commodity that can be transported globally. This trend is very much a result of the European Union's (EU) 20% renewable energy target for 2020, most of which is expected to be achieved by burning wood (World Rainforest Movement, 2014b). This has already resulted in increased pressure on European forest which are, however, not able to meet the increasing demand in the EU.

FAO figures on wood pellet imports into Europe have only been available since 2012 and they already show a significant increase from 8.5 million tons of imports in 2012 to 11.3 million tons in 2013. The UK alone registered an increase in imported wood pellets from 1.4 to 3.4 million tons (FAOSTAT, 2014). Most of the imported pellets come from the US, where wood pellets exports increased by more than 50% between 2012 and 2013, from 1.9 million tons to 2.9 million tons.



Other important exporters of wood pellets are Canada (1.6 million tons exported in 2013) and Russia (0.7 million tons exported in 2013). Increasing demand for wood in the EU causes – in the medium and long term – increasing pressure on land in the global South.

Wood pellets are also produced for export in the global South. In Maranhão, the company Suzano started to implement a model of specific eucalyptus ITPs for biomass energy. In such plantations, the rotation cycle of the trees is much shorter than usual (1.5-2 years instead of 6-7). Besides this, the eucalyptus trees are much more densely planted (about 8,000 trees per hectare versus 1,000/1,600 trees in a pulpwood plantation). The expected production is around 80 m³/ha/year, double the wood productivity of ITPs for pulp production (Souza and Overbeek, 2013).

Another wood-based ‘renewable energy’ option is also being promoted: the transformation of wood into liquid fuel, also called cellulosic ethanol. Currently, this is much more costly than producing wood pellets, for example, and therefore yet not a viable option for industry to invest in without sufficient subsidies (World Rainforest Movement, 2014c).

ITP companies are increasingly investing in research on genetically modified or engineered (GE) trees for more efficient and cheaper pulp production as well as to get improved results from ‘renewable energy’ options (woody biomass and cellulosic ethanol). The main objective is to increase production of cellulose for paper, or of woody biomass for wood pellets, as well as to improve the viability of ethanol production. In recent years, applications for the commercial use of GE eucalyptus trees have been submitted by companies both in Brazil and in the US. It remains to be seen whether the governments of Brazil and the US will uphold the precautionary principle and conduct detailed and long-term studies on the impacts of GE trees, as recommended by the Convention on Biological Diversity (CBD), before releasing these trees on a commercial scale.

GE trees add a number of potential risks and impacts to the already long list of negative impacts caused by ITPs. These include an even higher use of pesticides, water and soil nutrients as well as the risk of contamination of other non-GE trees and forests. ‘More productive’ plantations in Brazil, for example, will also be a further stimulus for the expansion of ITPs rather than leading to a reduction of the ITP area.

1.3.2 FSC certification as an essential tool for ITP expansion

When the Brazilian company Suzano opened its aforementioned new pulp mill in Maranhão in 2014, it announced that all of the wood consumed by the mill would be certified by the Forest Stewardship Council (FSC) (Suzano, 2014). FSC certification has become a powerful tool for ITP companies in legitimising their continuous expansion as a ‘sustainable’ business, in spite of the fact that ITPs continue to damage the environment and violate communities’ rights (Souza and Overbeek, 2013). It has turned out to be an opportunity for corporate business to ‘greenwash’ practices that are unsustainable by definition. Neither the planting of trees in extensive monocultures that depend on the regular application of agro-

FSC-certification has become a powerful tool for ITP companies to legitimise their continuous expansion as a ‘sustainable’ business.



toxins and chemical fertilizers, nor the apparently unlimited large-scale model that inevitably concentrates land that was once used by communities to sustain their livelihoods in the hands of a few represent significant obstacles to certification. Instead of the FSC challenging this unsustainable production model of paper and other wood-based products by calling on consumers to stop buying products from this model in the first place or, at least, to consume less, it merely suggests that consumers opt for certified products. Meanwhile, a market-based tool such as FSC certification is very attractive for the industry, because it does not challenge their expansion projects and plans.

The area of industrial tree plantations certified by FSC has steadily increased. In September 2014, 16.7 million ha of ITPs were FSC-certified worldwide, compared with 13.7 million ha in 2013 and 13.0 million ha in September 2012, an increase of 28% within two years (FSC Forest Stewardship Council, 2014a).

FSC has begun to engage with and accompany these new market opportunities which lead to plantation growth. Adding new product lines derived from plantations that can be FSC-certified also represents new business opportunities for those consultancy companies that carry out the profitable FSC certification audits.

The expansion of ITPs, both for 'traditional' uses such as pulp and paper and rubber products, as well as for the new uses such as carbon sequestration and renewable energy, mainly driven by Northern interests, represents a threat to the territories and livelihoods of rural communities in the global South. The continuing 'greenwashing' provided by FSC to such plantations seems to further drive rather than halt this expansion.

2

International trade policies

This chapter explores the impacts of international trade policy on agriculture in developing countries. We examine the foundation of the World Trade Organization (WTO) and investigate how its policies have triggered changes in agricultural patterns in developing and least developed countries. The establishment of major international trade agreements coincided with increasing international trade volumes of agricultural products and also changed country-level trade patterns (see **Chapter 3**). We end this chapter with a discussion of the consequences of WTO trade policies for the global South.

2.1 Liberalization of international trade: From GATT to WTO

At the end of World War II, the perceived need for future political stability led to the establishment of multilateral international organizations which could help launch and maintain a new economic world order. In addition to the IMF and the World Bank, a third pillar, the International Trade Organization (ITO), was negotiated as a specialized agency of the United Nations. In 1946, 23 contracting parties had concluded trade negotiations, which resulted in 45,000 tariff concessions covering about one-fifth of world trade. This set of tariff concessions and rules was then known as the General Agreement on Tariffs and Trade (GATT) and entered into force in January 1948. The aim of this agreement was to boost international trade by lowering trade barriers and to end protectionist measures that had been implemented during wartime. Based on the principle of free trade, GATT regulated customs tariffs and provided for harmonized legislation among its members (Reich, 2004), banning all commercial discrimination and promoting transparency. Over time, the number of contracting partners increased and reached 125 partners in 1995. Despite its transient nature, the General Agreement remained, with a limited number of amendments, as the only multilateral instrument governing international trade until the creation of the World Trade Organization (WTO) in 1995.

In the general framework of GATT, a number of multilateral negotiations, termed 'rounds', were conducted. The main rounds, such as the Kennedy Round and the



Tokyo Round, resulted in a reduction of tariffs. The Uruguay Round became another milestone. Opened in September 1986, it focused on negotiating tariffs specifically for agriculture, textiles, and services, and also included the principle of intellectual property.

The WTO is based on a multilateral agreement between countries which provides a forum for negotiating trade concessions and removing trade barriers, and controlling and reglementing the multilateral trading system. The basic principle of the WTO is that goods and services imported to one country from another must generally have free market access in the importing country. The WTO provides the basis for negotiations on whether existing tariffs violate this free access and may also concern itself with non-tariff measures in certain situations.

The principles shaping WTO policies are:

- Non-discrimination: The members of the WTO must (a) provide equal treatment in trade matters to all members, and (b) imported goods and services must receive treatment equal to that of domestic products.
- The free movement of goods and services: Trade liberalization is achieved through multilateral trade negotiations to reduce trade barriers in the form of tariffs and non-tariff barriers such as import licenses or quotas.
- Predictability: The attempt to keep the business environment stable and predictable.
- Competition: The WTO discourages unfair trade practices such as dumping and export subsidies.
- Aid to less developed countries: Developing countries have more time, and receive special treatment and greater flexibility to adjust to trade commitments after signing the WTO treaty.

In 2014, the WTO had 160 member countries, with developing countries accounting for almost 80% of the total member countries. In 2014, there were 24 observer governments who have been negotiating for admission. Other organizations such as the Organization for Economic Cooperation and Development (OECD) and several specialized UN agencies, including the UN Conference on Trade and Development (UNCTAD), the World Bank and the IMF have observer status in the WTO's General Council.

2.2 The WTO agreement on agriculture

Agriculture is an integral part of the WTO agreements. The related regulations cover both primary and processed agricultural products. Before GATT in 1947, international regulations applying to the agricultural sector were less strict and did not have the goal of homogenizing exchanges globally. Countries were therefore free to apply higher rates if they considered these necessary to protect their internal market against imports. Developed countries in particular maintained high tariffs and imposed quotas as well as discretionary and variable fees on their products. Thus, in order to be competitive in an export-oriented economy, export



subsidies were inevitably encouraged. Against this backdrop, the WTO Agreement on Agriculture requires a progressive agricultural reform the main objective of which is the establishment of an agricultural trade system that is intended to be fair and equitable for WTO members and market-oriented (Gonzalez, 2002). As part of this agreement, the regulations include: (a) **tariff measures**, which increase market access, focus on quotas; various import taxes, minimum prices for import, discretionary import licensing and volunteer export restrictions. A key element is that all countries, including the least developed countries (LDC), are required to bind all tariffs⁵ on agricultural products; and (b) **to convert non-tariff barriers into tariff equivalents**. Non-tariff barriers (NTBs) refer to restrictions that result from prohibitions, conditions, or specific market requirements that make importing or exporting products difficult and/or costly. NTBs also include unjustified and/or improper application of non-tariff measures (NTMs), such as sanitary and phytosanitary (SPS) measures and other technical barriers to trade (TBT) (Cadot et al., 2012). To harmonize reductions of these barriers, WTO members have agreed to convert non-tariff barriers into tariff equivalents (TE). These would be calculated on the basis of the average world market price, subject to tariff barriers, and the local price in the importing country as follows: $TE = (\text{local price} - \text{external price}) / \text{external price}$.

Other measures and commitments of the Agreement on Agriculture are as follows:

- **Tariff reductions:** Least developed countries (LDC) are not required to reduce their tariffs, but all members must undertake their best endeavours. Non-tariff measures may, however, be kept in place if imports of a specific product represent less than 3% of the domestic consumption or if the product has received special treatment based on food security (e.g., staple foods in developing countries) or on environmental concerns.
- **Special safeguards:** This agreement regulates special safeguards for imports. The measures address the concerns of importing countries who fear that the elimination of quotas will lead to import surges that disrupt local markets.
- **Commitments on changing national support to producers:** The disturbances observed in the international market are not only due to local export product protections, but also to domestic support of producers by member countries such as export subsidies or direct payments to producers by the government.
- **Aggregate measures of total domestic support (AMS):** Developed and developing countries are required to reduce their AMS (with longer deadlines for developing countries). There is no reduction required for LDCs.

⁵ Binding tariffs means the commitment of member countries ... not to increase a rate of duty beyond an agreed level. Once a rate of duty is bound, it may not be raised without compensating the affected parties (WTO, 2015)



2.3 The Common Agricultural Policy (CAP) and its impacts on the global South

The Common Agricultural Policy (CAP) is the oldest and one of the most important policies of the EU. First characterized in the Treaty of Rome in 1957, it came into force in 1962 with the objective of:

- increasing agricultural productivity,
- ensuring a fair standard of living for farmers,
- stabilizing markets,
- ensuring security of supply, and
- ensuring reasonable prices for consumers.

The CAP has benefited farmers through indirect aid ('guaranteed prices'), which ensures a minimum price for export products by subsidizing the difference between the market price and the guaranteed price. The CAP also benefits EU farmers through the enforcement of an internal policy within the EU to protect the European market from competition of cheaper, imported products.

The CAP has been criticized for benefiting large farmers at the expense of smaller producers. The blogger Angela Shoeman (2010) states that CAP has led to a *redistribution based on the level of production. Hence, until the nineties, far from supporting small farmers, 80% of CAP subsidies were redistributed to the 20% of the farms producing 80% of agricultural outputs. In addition, it triggered great distorting effects: Agricultural and food products' prices greatly increased at the expense of consumers (especially impacting the poorest households). It encouraged farmers to overproduce, which in turn induced the EU to dump world markets with those goods.* For example, the 25% largest farms in the EU-27 received 74% of total CAP support, whilst the 25% smallest farms received only 3% of total CAP support in 2007 (Fritz, 2011; GRAIN, 2014).

Over-production in the EU member states is often 'dumped' on export markets and has contributed to an increased import dependency among the world's poorest regions, especially the 70 low-income food-deficit countries (LIFDC). *More than half of the LIFDCs have a very high cereal import dependency, relying on imports for more than 30% of their cereal consumption* (Fritz, 2011).

The nearly 50-year-old CAP has both shaped EU policies on agriculture and agricultural trade and also contributed significantly to European integration. However, despite a variety of policy reforms that changed the character of the CAP, there are several aspects that can be seen as potentially problematic (Fritz, 2011; Skogstad et al., 2013):

- European agribusiness has been and continues to be a key beneficiary of developing countries' import dependency.
- Developing countries have gradually lost their agricultural export shares while the EU has increased its own share of global exports.



- CAP intervention prices and export subsidy payments stimulate overproduction in the EU, which then facilitates European food industry to dump these products on international markets.
- The rise of the EU as an agricultural trade power has triggered conflicts with the US, which has increasingly lost market shares to European competitors. To defend their trade positions on third country markets, both trade powers have entered into a costly subsidy race.
- European wheat dumping has also contributed to changing dietary patterns in the South, favouring the production and consumption of wheat-derived products instead of locally grown crops like cassava, sorghum, millet, maize or rice.

Box 2 International food aid

Besides trade policies, food aid is another factor influencing global trade and production patterns. International food aid involves the export of food commodities for free or at very low prices. The impact of food aid is not always positive (FAO, 2001). Food aid, backed by the dominant industrial agriculture model, has become a key driver in gaining access to food markets.

The example of Ethiopia (also see **Chapter 5.3**) demonstrates how food aid can become a disincentive for local production, as Gelan (2007) has documented. This is because when the market is flooded with cheap or free food, local production is no longer competitive. Producers who manage to produce despite the difficulties are unable to sell their goods.

Berthelot (2001) found that donations increase when prices on the world market are lowest, i.e., when it does not pay to sell the surplus production of cereals from Northern countries. The emergency situation faced by vulnerable populations is not necessarily the single driver behind donations made.

For example, the Institute for Agriculture and Trade Policy (IATP) states explicitly who the beneficiaries of American food aid are (Murphey 2005):

- In 2003, the US government purchased products intended for food aid from its **agro-industrial companies** at prices 11% to 70% higher than the market average.
- During the period 2000-2002, nearly 40% of the cost of American food aid was paid to American **shipping companies**.

Food aid as it is organized today provides food to those in need but may simultaneously damage local production in recipient countries and be used to dispose of agricultural surplus production and provide an entry point into new markets (Kripke, 2005).

2.4 Consequences of trade liberalization

The liberalization of trade in agricultural products has provided agribusiness corporations with international market access. This has been done by enforcing international treaties, such as that of the WTO, which enabled Northern investments in transnational supply chains and which is considered a precursor of the current land grab (McMichael, 2013a). These treaties contain prerequisites which farmers must fulfill if they wish to participate in international markets. These prerequisites curb farmers' freedom to choose which seeds they plant, for example, and also include the imposition of a land market, based on private property, without regard for local land tenure and use systems (McMichael et al., 2007; McMichael, 2013a; 2013b; NZPA, 2015).

As a result of trade liberalization, some developing countries tend to focus on cash crops with export value, often at the expense of food crops for local consumption. The consequence of this reorientation is that the countries become increasingly



dependent on imports. If prices of imported food increase, the country may face a foreign exchange deficit, which in turn undermines the ability to purchase enough food for its population.

3

Patterns of global biomass production and trade

3.1 Global biomass production

The following chapter describes biophysical aspects of the second and third food regimes (Friedmann and McMichael, 1989). We draw on material flows from Schaffartzik et al. (2014) that cover extraction and trade of biomass from 1950 – 2010. We further link these flows to data on national food consumption for the year 2010 and thus identify eight different country groupings according to their food import dependency. Thus, this section provides an exploration of current biophysical trends in global food production.

Global extraction of biomass increased from roughly 7 Gigatons (Gt) to 19 Gt between 1950 and 2010, i.e., by a factor of 2.5. While some global regions such as Western Europe have much lower growth rates (a 1.5-fold increase during the same period), we observed 3-fold increases in Sub-Saharan Africa or Latin America. However, the per capita availability of biomass only increased slightly from 2.7 tons per capita in 1950 to 3.1 tons per capita in 2010 (**Figure 4**), indicating the strong relation of biomass extraction to population growth (Steinberger et al., 2010). Many countries and entire regions or country groupings have clearly established or are developing an industrial metabolism in which the share of biomass is reduced to between one-third and one-quarter of total material consumption. In some countries and regions, however, biomass continues to play a dominant role in socioeconomic metabolism (Schaffartzik et al., 2014).

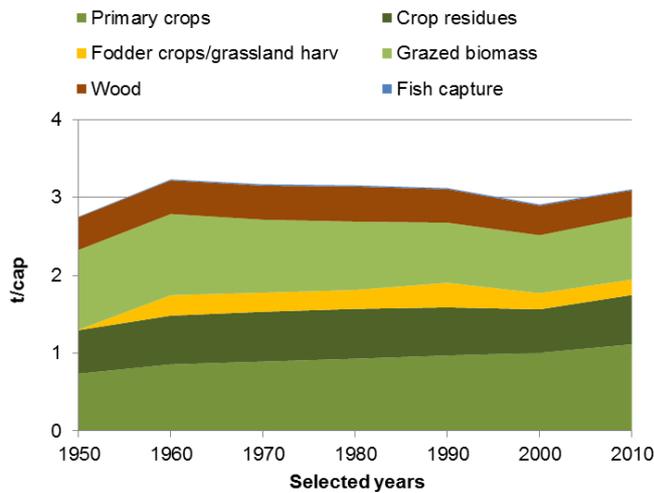


Fig. 4

Global extraction of biomass between 1950 and 2010 in tons per capita (t/cap) and by main biomass categories – (no data for fodder crops available for 1950).

Data Source: Schaffartzik et al., 2014

Despite the very low growth in per capita biomass extraction, important shifts within the main biomass categories have taken place. The share of the harvest of primary crops in total global biomass harvest is the only one to have increased across this 60-year period. Primary crops are all types of staple crops such as cereals, roots and tubers, vegetables and fruits, pulses and oil bearing crops, as well as fibre crops (e.g., cotton), spices and stimulants (e.g., tobacco). While fodder crops played a more significant role in animal feed in 2010 than in 1950, they also 'replaced' some of the grazed biomass in terms of the share in overall biomass consumption. This switch towards more grain feedstuff increases the input/output efficiencies (measured in t/t) of livestock systems, because grains have a higher nutritional per weight value than roughage. This switch can either be due to the replacement of ruminants with monogastrics⁶ or due to more intensive livestock systems.

This intensification comes at a high price for food security. One major function of ruminant livestock is that they can convert nonedible (e.g., grass, residues) into edible biomass (Erb et al., 2012b). Thus, grazing can be seen as a means of harnessing marginal land resources that cannot be used as croplands. The use of these marginal lands makes it possible to increase the resource basis, i.e., the food base of society. Extensive grazing systems are still, in terms of area extent, one of the most significant forms of land use globally, providing a multitude of environmental, economic, social, and cultural benefits. Where these pastoralist systems (Young, 1999; Gura, 2008) are replaced with more intensive forms of land use, indirect land use change is often caused and land use conflicts and

⁶ Cattle, sheep, goats are ruminant livestock, while pigs and poultry are monogastric livestock. The main difference is that monogastric species have a simple, single-chambered stomach, while ruminants have a four-chambered complex stomach; therefore, ruminants can digest complex molecules such as grass fibres, which monogastric species cannot digest. Ruminant species can be fed exclusively from roughage (Erb et al., 2012b).



threats to local food security and sovereignty result (Fischer et al., 2009, 2001; Lapola et al., 2010).

The relatively constant per capita figures for wood extraction conceal an important shift from wood fuels to industrial timber, i.e., from a comparatively low to high degree of industrialization of wood production and use, respectively. Wood fuels are often substituted by fossil fuels, and the use of timber for pulp, paper and other industrial uses of biomass increases with industrialization.

From 1950 to 2010, global harvest of primary crops increased by a factor of 4, from 1.9 Gt in 1950 to 7.7 Gt in 2010. At the same time, the reported harvested area associated with the production of these primary crops expanded from 1.1 billion hectares (Gigahectares - Gha) in 1961 to 1.5 Gha in 2010, thus increasing by a factor of 1.4 (FAOSTAT, 2014)⁷ and indicating both a quantitative and a qualitative transformation of the land use associated with primary crops production. During this period of time, arable land and land covered by permanent crops also increased by 0.16 Gha and the increase in harvested area was not only due to multi-cropping (i.e., harvesting of the same area more than once or for more than one crop during the agricultural year). The disproportionate increase in harvested primary crops compared to the area expansion is an indicator for higher yields and the intensification of land use. The highest yields in 2010 can be found in Western Europe, Northern America, but also in South and Southeast Asia, the lowest yields in Sub-Saharan Africa, Central Asia and Russia, and in Northern Africa and Western Asia with rates that are 50-60 percent lower than the highest yields (Mueller et al., 2012).

The difference between observed yields and those attainable in a given region, referred to as the 'yield gap', is currently under debate among scholars interested in food security (Mueller et al., 2012; West et al., 2014). The critical issue lies in the word 'attainable' which is difficult to define. Yields in highly industrialized regions are based on a multitude of factors, including agricultural inputs such as water, fertilizers, and pesticides as well as technological and scientific advances in machinery and crop breeding. The possibilities of closing yield gaps, i.e., increasing observed yields until they match attainable yields, vary considerably by region and current intensity of land use. Next to the challenges that are related to economic and organizational requirements, avoiding the environmental burdens of intensification is not trivial. Most yield increases were reached through a higher application of inputs such as fertilizers and pesticides, where parts of the applied inputs leach into ground water (Gunkel et al., 2007). While some improvements of yields may be reached with relatively simple changes, more harvest does not always imply improved livelihoods, as the debate around land grabbing clearly shows (GRAIN et al., 2014).

⁷ These figures correspond to 'area harvested' as reported by the FAO. Where the same area is harvested more than once during the agricultural year (multi-cropping), it will also be accounted for more than once in this indicator so that it may be larger than, for example, total arable land.

3.2 Global biomass trade

Although the increasing biomass production hardly affected average global per capita availability of biomass, it did coincide with soaring trade volumes for biomass. Globalization leads to an increasing spatial disconnect between the places where biomass products are consumed and the places where the land to grow the biomass is located. Between 1962 and 2010, internationally traded biomass increased from under 0.3 Gt to 1.4 Gt, a nearly 5-fold increase which corresponds to a doubling of the share of global biomass extraction being traded (Figure 5).

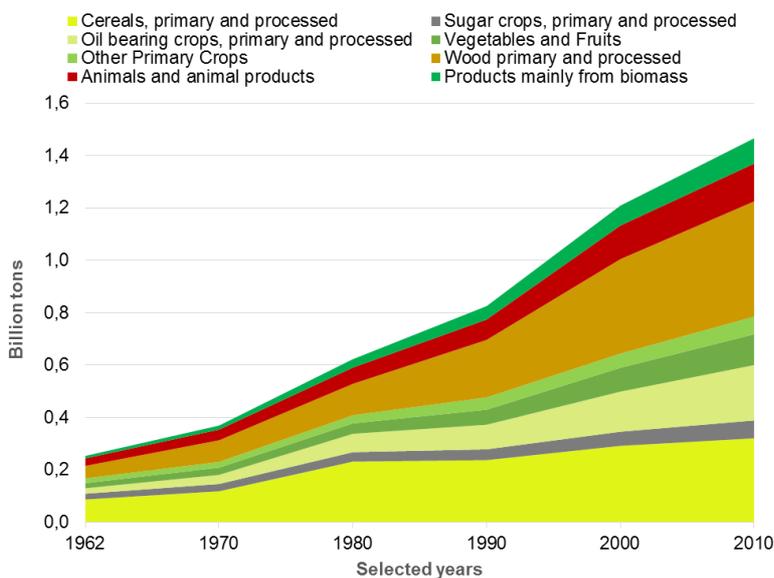


Fig. 5

Global trade of biomass between 1962 and 2010 in Gt, aggregated into 8 different categories

Data Source: Schaffartzik et al., 2014

The biomass types which experienced the strongest growth in trade (by an order of magnitude) between 1962 and 2010 were oil bearing crops, biomass products which cannot be allocated to a single crop type (e.g., animal feed, pet food, fermented beverages), and timber (which is the single largest biomass trade category in 2010) including pulp and paper. These were followed by meat and dairy products as well as fodder crops with an 8-fold increase between 1962 and 2010. While these products are generally used in all countries, it can be assumed that demand for such products increases with rising income (e.g., for vegetable oils as agrofuel feedstock, for pulp and paper, and especially for meat and dairy products). Cereals remained the edible type of biomass with the largest trade volume, despite the lower (4-fold) increase compared to the other biomass types.

In examining patterns of global biomass production and trade, we distinguished a total of 175 countries in 8 country groupings in order to reflect both the different roles played by countries within the global biomass economy and their contribution to global biomass use, differentiating producers and consumers. Since this empirical work forms the basis for considerations of food-import dependency, only edible biomass is considered in the following.



3.3 Country groupings

In order to identify meaningful patterns in international biomass trade, we have allocated countries into country groupings according to both socioeconomic and biophysical elements of their socio-metabolic profiles. The base year for the country groupings is 2009, the most recent year for which all of the required data is available. In order to make different roles in the global economy visible, we grouped countries according to their income and distinguished high-income countries as per the threshold defined by the World Bank for 2009 (12,195 USD per capita per year (USD/cap/yr)) from all other countries. This threshold is based on per capita income, so that high income countries do not necessarily correspond to those defined by the United Nations as developed countries. As a proxy for biomass available for direct human consumption, we used the data on food supply provided by the United Nations Food and Agriculture Organization (FAO). Countries were grouped according to whether or not their food supply in 2009 (measured in kilocalories per capita and year (kcal/cap/day)) amounted to at least 90% of the 2009 global average consumption of 2,831 kcal/cap/day.

The actual food availability at the national level is likely to be lower than this indicator suggests, mainly because food waste has not been excluded. Current estimates arrive at 25% food losses from retail to the household level, with most of the losses occurring in the beginning of the product chain in developing regions, and at the end of the consumer chain in the wealthy regions (Gustavsson et al., 2011; Smith et al., 2013). Food supply is reported as a national average and food availability for the individual may be lower or higher depending on the distribution of food resources within the country (Kastner et al., 2012). In order to take the role of biomass trade for the countries into account, the groupings were further defined by distinguishing countries which are self-sustaining in terms of the single main component of their food supply from those who were import dependent in this regard. Where animal products were the single largest component of food supply, not only the direct import dependency in terms of net imports of animal products was considered but also the import dependency for animal feed.

Table 1
Overview of indicators, thresholds, and data used in defining country groupings
 Data Sources: see Table

Characteristic	Indicator/Threshold	Data Sources
Income	High-income countries were distinguished from all other countries using the 2009 World Bank threshold for high income (GDP of 12 195 USD/cap)	2009 per capita GDP from UNSTAT
Food availability	Those countries in which food supply amounted to at least 90% of the 2009 global average food supply of 2831 kcal/cap/day were considered countries with high food availability	2009 food supply data (FAOSTAT, 2014)
Role of trade	We distinguished countries which were net importers of their main source of food supply (if this main source was animal products, import dependency was calculated for feed) from those which were balanced (self-sustaining) and/or net exporters of their main source of food supply	FAOSTAT, 2014



Based on the indicators and the defined thresholds (**Table 1**), three main country groupings were identified which were further split into eight sub-groupings (**Table 2**). Grouping *A* consists of 41 high income countries. These countries all lie above the threshold in terms of their food supply and can therefore all be considered as countries of high food availability. With the exception of two countries located in the *B* grouping due to the lower level of their per capita income, all countries in which animal products are the single largest component of food supply are included in the *A* grouping. The *B* grouping includes all those countries in which average food supply amounts to at least 90% of the global average in 2009 but per capita income is below the 2009 threshold for high-income countries. The single main source of food supply in almost of all of these countries are different types of cereals (mainly: wheat, rice, or maize) with countries in which the diet is dominantly based on starchy roots forming the exception. Grouping *C* consists of those countries which also do not meet the threshold criterion for high-income countries and additionally have an average food supply which lies below 90% of the 2009 world average. Two of our case study countries, Paraguay and Ethiopia, are part of this former grouping, while Indonesia is part of grouping *B*.

Figures 6a and **6b** display global maps for our 8 defined country groupings. For **Figure 6a**, we have grouped 175 countries and territories according their average national income (GDP/cap), food availability and the role of trade of food biomass (i.e., the role of trade of the single most important staple, i.e., animal products, cereals, and to a lesser extent, roots and tubers). **Figure 6b**, however, shows the overall biomass trade pattern of these 175 countries. The comparison of these two maps reveals whether a country is e.g., import dependent for their most important staple, but a net exporter of biomass. Namibia, Afghanistan, or some Northern African countries show this pattern. Many European nations are import dependent in both categories.

Table 2
Overview of three main
country groupings and
sub-groupings

Grouping		Description	Examples
A.	High income, high food supply	Countries with 2009 income amounting to at least threshold value for definition of high income countries (12 195 USD/cap) and food availability amounting to at least 90% of 2009 average in kcal/cap/day [47 countries]	
	<i>Ai.</i> Import-dependent A	Out of the 41 high income, high food supply countries, 32 significantly rely on net imports to provide their most important source of food supply	Denmark, Kuwait, Ireland, Spain, Slovenia
	<i>Ae.</i> Self-sustaining/exporters A	The remaining 15 high income, high food supply countries are able to largely cover their food supply from domestic sources and/or are net exporters of agricultural goods	France, Greece, Austria, Germany, United States of America, Australia
B.	High food supply	Countries with 2009 income below threshold value for definition of high income countries (12 195 USD/cap) and food availability amounting to at least 90% of 2009 average in kcal/cap/day [71 countries]	
	<i>Bi.</i> Import-dependent B	Out of the 56 high food supply countries, 24 have an import-dependency rate above 50% for their single most important food supply type (and conversely a self-sufficiency ratio below 50%)	Jamaica, Maldives, Costa Rica, Lebanon, Malaysia, Côte d'Ivoire,
	<i>B0.</i> Self-sustaining/importers B	28 countries have a self-sufficiency ratio above 50% but are nonetheless net importers of their single most important food supply source	Egypt, Albania, Iran, Mexico, Turkey, Chile, Brazil, Belarus, Indonesia
	<i>Be.</i> Self-sustaining/exporters B	19 countries in this grouping have a self-sufficiency ratio above or approaching 100% and are net exporters of their main source of food supply.	Burkina Faso, Ghana, China, Uruguay, Poland, Romania, Argentina, Ukraine, Russian Federation
C.	Low food supply	In a total of 57 countries, income was below the 2009 threshold for high-income countries and food supply was below 90% of the 2009 world average.	
	<i>Ci.</i> Import-dependent C	Out of the 54 low food supply countries, 18 are dependent on imports to cover demand for the single most important source of their food supply.	Djibouti, Lesotho, Swaziland, Eritrea, Zimbabwe, Haiti, Angola, Kenya, Mongolia
	<i>C0.</i> Self-sustaining/importers C	22 countries have a self-sufficiency ratio above 50% but are nonetheless net importers (>1t/cap) of their single most important food supply source	Sierra Leone, Pakistan, Niger, Bolivia, Malawi, Mozambique, Uganda
	<i>Ce.</i> Self-sustaining/balanced and exporters C	17 countries in this grouping have a self-sufficiency ratio above or approaching 100% and are balanced (net imports < 1t/cap) in terms of the supply of their main source of food supply (or are exporters)	Rwanda, Ethiopia, Cambodia, Tanzania, Ecuador, India, Paraguay

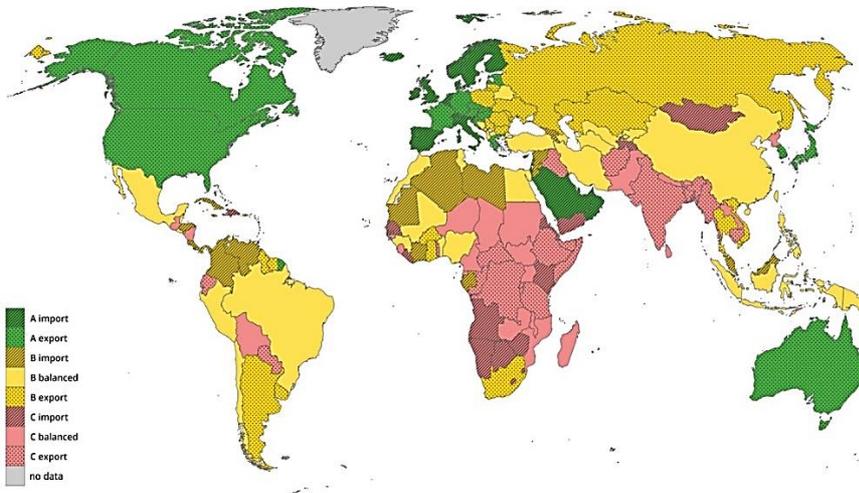


Fig. 6a

Global map of countries grouped by average national income (GDP/cap), food availability and the role of trade in food biomass

Data Source: Schaffartzik et al. 2014

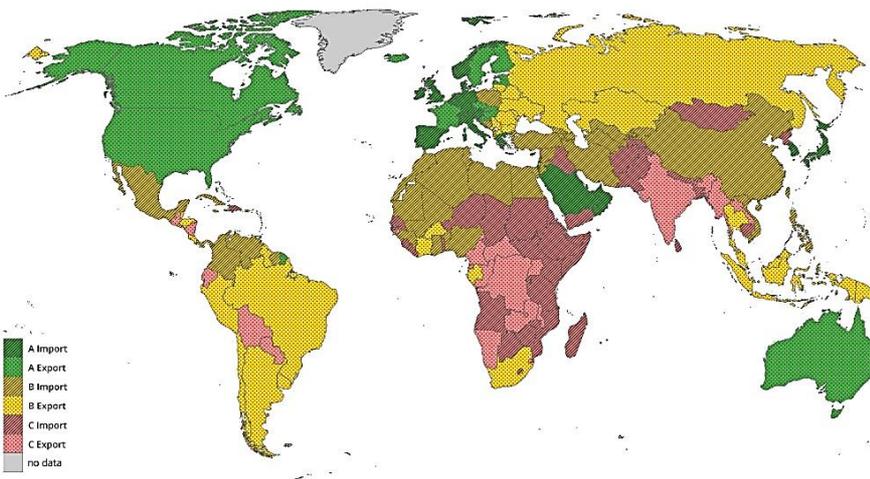


Fig. 6b

Global map of countries grouped by average national income (GDP/cap), food availability and the role of overall biomass trade (all biomass categories included)

Data Source: Schaffartzik et al. 2014

3.4 Metabolic profiles of country groupings

Upon examining the overall apparent material consumption of the country groupings (**Figure 7**), we find that **grouping A**, home to slightly over 1 billion (Bn) people in 2010, is characterized by a large overall metabolism in the same year. It includes countries such as the US and Canada, Australia, Europe, and some Middle Eastern Countries. At 15.3 t/cap, domestic material consumption in this grouping is 1.5 times as large as the world average that same year. The metabolic profiles of countries in this grouping show the pattern of mature industrialized economies: High per capita use of resources⁸ and relatively high shares of non-renewable resources with mostly stagnating or even shrinking shares of biomass.

⁸ There are considerable differences among countries in this grouping which are mostly rooted in population density: Densely populated countries have lower metabolic rates than sparsely populated countries.

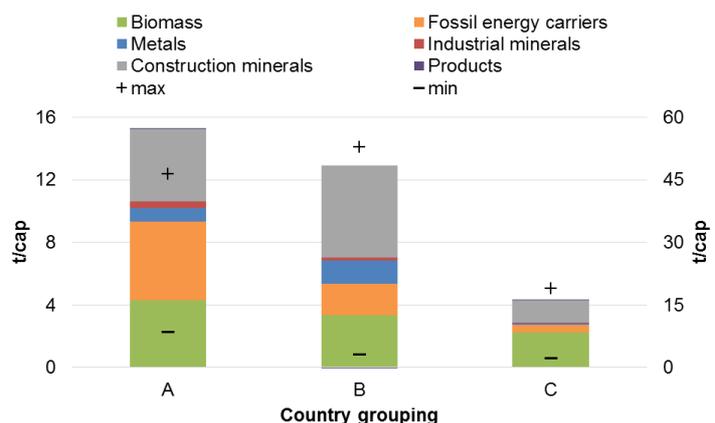


The metabolism of these economies depends heavily on the input of fossil fuels as energy carriers and mineral resources to build up and maintain infrastructure and machines. The metabolic profiles are composed of relatively equal shares of 30% biomass, fossil energy carriers, and construction minerals each (Schaffartzik et al., 2014). Most of the biomass consumed in these economies is used directly and indirectly for human nutrition. However, there are increasingly non-food demands for biomass such as agrofuels, lubricants or pulp and paper, which increase the pressure on domestic and foreign land resources.

Grouping B, the largest group in terms of population size (3.4 Bn inhabitants in 2010) has a somewhat lower metabolic level (12.9 t/cap) but still ranges above global average. In general, the economies of grouping B are much more diverse in terms of size and composition of their metabolic rates than groupings A and C. However, among these countries, construction minerals alone make up almost 50% of DMC and consumption of these is higher in per capita terms than in the countries of grouping A. The consumption of the throughput materials biomass and fossil energy carriers, which are in general not used to build up societal stocks, is lower. The metabolic profile of this grouping is not that of mature industrialized economies but of economies (rapidly) building up infrastructure and buildings stocks. China, which consumed 10.5 t/cap of construction materials in 2010, plays a strong role in shaping the metabolic profile of this whole group, as do other rapidly industrializing countries therein. Overall, the common pattern for this country grouping is that of a highly dynamic metabolism, as these countries are moving towards the industrial pattern outlined above.

Grouping C, which was distinguished from the others by its comparatively low food supply, exhibits a low level of overall material use. This group is primarily composed of Sub-Saharan countries and some Asian and Latin American countries. In 2010, the 2.4 Bn people in this grouping consumed only 4.3 t/cap of material. Out of these, 50% were biomass but even this only amounted to half of the per capita biomass consumption of the countries in grouping A. The primary energy sources are mostly based on biomass, and the overall metabolic pattern is one typical of agricultural rather than industrialized societies. At over 35% of DMC, construction minerals were the second largest group of materials consumed. The social metabolism in grouping C depends much less on the industrial trio of metals, minerals, and fossil fuels than the countries in groupings A and B.

Fig. 7
Domestic material consumption (DMC = domestic extraction plus imports minus exports) in tons per capita (t/cap) in 2010 by country grouping A, B, and C. Please note that the maximum (max) and minimum (min) per capita DMC are plotted on the secondary y axis
 Data Source: Schaffartzik et al., 2014





Each of the country groupings is composed of sub-groupings with distinct metabolic profiles (**Figure 8**). The dependence on net imports of specific biomass products is the defining characteristic of sub-grouping *Ai*, visible in biomass forming the largest category of overall physical net imports. This grouping is also an important net exporter of fossil energy carriers; this pattern is repeated (with lower per capita net imports) for the countries in *Bi* and *Ci*. The net exporters of biomass in grouping *Ae* exhibit the highest per capita value of net imports of fossil energy carriers. At a lower level, the same pattern can be observed in comparing the *Ci* and the *Ce* countries, while the *Bi* as well as the *Be* grouping both are the highest per capita net exporters of fossil fuels. Our country groupings indicate that an exchange of 'food for fuel' (and vice versa) can be observed, except in grouping *Be* where both, biomass and fossil fuels, are net exported. In some of the highly food-import dependent countries, such as the countries in the Middle East, imports are crucial in meeting the food demand; approximately 50% of the domestic food consumption is imported and vulnerability to international food price volatility is high (Ianchovichina, 2012).

Large-scale land leases threaten local food security

In some countries, the exchange of 'fuel for food' via international trade has recently been complemented with investments in agricultural production in other world regions - Sub-Saharan Africa, Latin America, and Asia - aimed at securing long term access to food. Especially after the food crisis in 2008, heavily food-import dependent countries invested in large-scale acquisition of land abroad (Cotula et al., 2009). GRAIN (2008) summarizes this strategy as follows: *governments aid private companies investing abroad, using the rhetoric of 'win-win' to describe the exchange of long-term access to land for the provision of gas, oil and technology. By replacing imports (mainly from Europe) with produce from land bought or leased abroad, the need for traders was largely eliminated, impacting international trade patterns.*

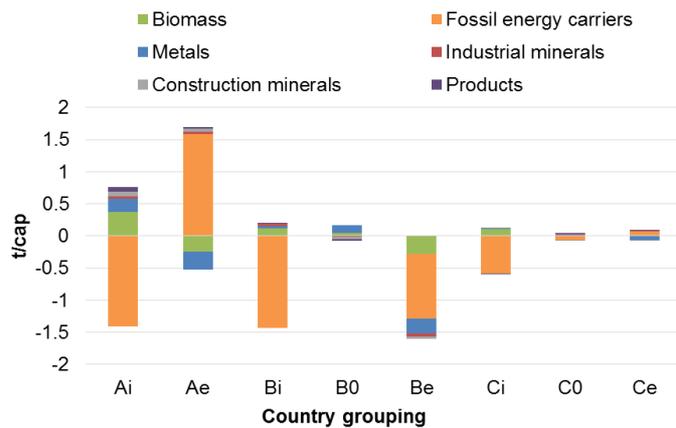
Foreign leases on vast areas of agricultural area are, however, often not beneficial to the local population. Farmers and local communities (such as pastoralists that extensively use vast areas in a migratory manner) lose access to land, the basis of food sovereignty for these communities. Despite promises made by governments and investors of jobs and income linked to the land leases, there is evidence that large industrial agriculture replaces jobs through technology. Empirical data suggests that palm oil plantations in Indonesia employ only one worker per 4 to 10 hectares of land, fuel crops in tropical regions provide 3.5 jobs per 10 hectares, eucalyptus two, and soybeans only a half-job per 100 hectares (Li, 2011; McMichael, 2012; Overbeek et al., 2012). Large-scale land leases require organizational restructuring of land use: Smallholder farms and forests are converted to cropland and/or plantations, directly connected to international markets. There is not always a suitable alternative available for farmers who are driven into more marginal land or away from subsistence farming altogether.



Fig. 8

Physical trade balance (PTB = imports – exports) in tons per capita (t/cap) in 2010 by country sub-groupings

Data Source: Schaffartzik et al., 2014



3.5 Extraction of biomass by country groupings

In 2010, more than half of global biomass extraction occurred in the countries of grouping *B* while groupings *A* and *C* each contributed approximately one quarter. Due to the high population of the countries in grouping *B* and the effects of trade, however, this high rate of extraction translates into a per capita consumption of biomass which is lower than in grouping *A*, but still considerably higher than in grouping *C* (**Figure 7**).

In the high-income and/or high food supply countries of groupings *A* and *B*, the country sub-groupings which are characterized by their net exports of biomass products (*Ae* and *Be*) are also the countries with the highest per capita extraction of biomass (see **Figure 9**). In grouping *C*, to which 2 of our conflict case studies belong, we find that those countries in which net imports are very small or which are net exporters (*Ce*) are characterized by the lowest per capita biomass extraction globally. In comparing groupings *A* and *B*, we see that the level of extraction coincides with the role of biomass trade in the country grouping. The composition of biomass extraction is more strongly tied to the monetary and food 'richness' of the countries. The relatively high share of fodder crops in the high-income countries points to more industrialized livestock systems, where ruminant and monogastric species are fed with high-quality feed, which could technically also feed people. This trend towards industrial livestock systems and the spatial and economic separation of crop and livestock production makes it possible for regions with high population densities to 'outsource' some of the environmental pressures associated with their consumption pattern to other regions (Galloway et al., 2007), entailing a lower self-sufficiency that can be interpreted as an increased dependency on international markets (Erb et al., 2012b).

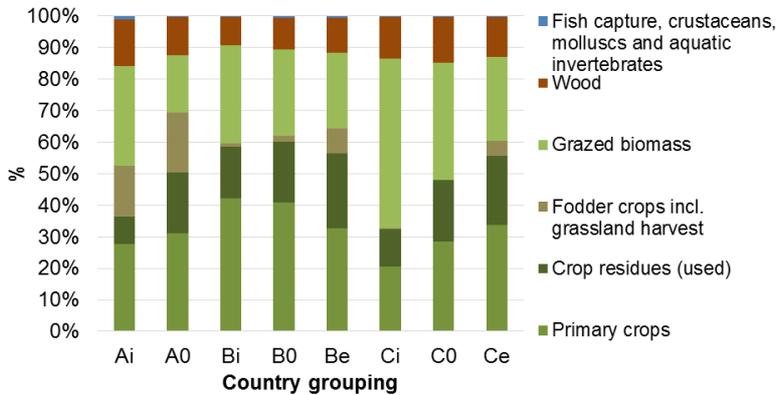


Fig. 9
Domestic extraction of biomass in tons per capita (t/cap) in 2010 by main biomass categories and country sub-groupings

Source: Schaffartzik et al., 2014

In grouping C, however, the difference between import dependent and balanced or exporting countries lies not in the higher extraction of biomass as in grouping A and B, but in an altered composition of biomass DE: In grouping Ce, the share of primary crops is comparable to the other two exporting groupings (Ae and Be), the production of fodder crops is significantly higher than in the other two C groupings, and the role of grazing in total biomass extraction is much less pronounced. Overall, the composition of biomass extraction by country groupings reflects the postulated link between industrialization of agriculture and production for export (Kastner et al., 2014). Some scholars suggest that there are potential spill-over benefits from the production of cash crops for export to the production of food crops for domestic supply. For example, commercialisation schemes may induce follow-up investments or foster a climate more favourable to the granting of financial credit. Technology, know-how, and management skills developed for export production can also benefit production for domestic consumption (Govereh and Jayne, 2003; Poulton et al., 1998). Yet, an increasing amount of studies question such spill-overs, arguing that the initial costs of starting a business and the high level of transaction costs compared to attainable income in the early stages, and the cultivation of high-yield crop species are often not feasible for smallholders (Fafchamps, 1992; Jayne, 2002; Jayne et al., 2002; Jayne and Jones, 1997; Fafchamps and Hill, 2005).

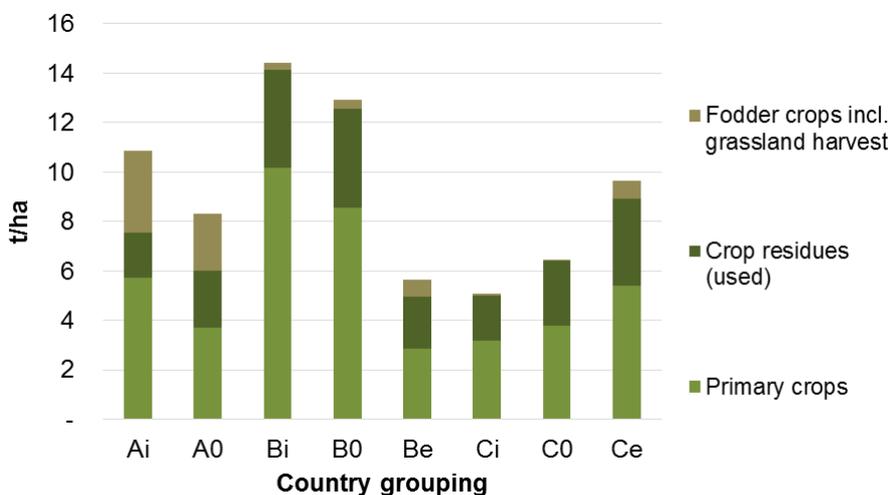


Fig. 10
Domestic extraction of cropland-based biomass in tons per hectare (t/ha) in 2010 by country sub-groupings

Data Source: Schaffartzik et al., 2014



The extraction of biomass resources is both dependent on the availability of and access to agricultural land (i.e., cropland or pastures) and harvest achievable on that land under given conditions of production. In order to include this aspect in the analysis of our country groupings, we have calculated the relationship between primary crops and fodder crops harvest and the available arable land (**Figure 10**).

The fodder crops harvest indicated here includes grassland harvest (e.g., hay), so that the values may represent an overestimation for those country groupings in which the share of grassland harvest in the fodder crops category is high. The trends which can be identified within the *A* and *B* country groupings on the one hand and the *C* country grouping on the other hand differ quite substantially: in the export-oriented economies of grouping *A* and *B* (i.e., *Ae* and *Be*), the ratio of crops harvest to arable land is lower than in the import dependent country groupings. In the *Ae* grouping, much more biomass is harvested than in the *Ai* grouping but the arable land required to generate this harvest is disproportionately larger. Additionally, grouping *A* produces a high amount of fodder crops per area, indicating that its livestock is fed with rather intensively produced crops. In the *Be* grouping, more biomass is harvested than in the *Bi* grouping but, again, a disproportionate amount of arable land is required to enable this harvest.

Within grouping *C*, on the other hand, the export-oriented economies (*Ce*) are able to harvest more biomass from each unit of arable land than the import dependent economies in this grouping. This pattern in grouping *Ce* is different to the patterns in groups *Ai*, *Bi* and *Bo*, where the countries that can produce more on their arable land use a larger share of this production domestically. This pattern is important as those countries that are food insecure anyway use a larger share of their productive land for exports than the food secure countries in groupings *Ai*, *Bi*, and *Be*. It is thus an indication of an export-oriented development path in these countries, eventually favouring export production instead of the production of domestic food crops.



3.6 Biomass trade by country groupings

Trade accounts for the difference between the biomass extracted and the biomass available for consumption within the country groupings. Thus, it also plays a crucial role in explaining the level of food supply according to which grouping a country was allocated.

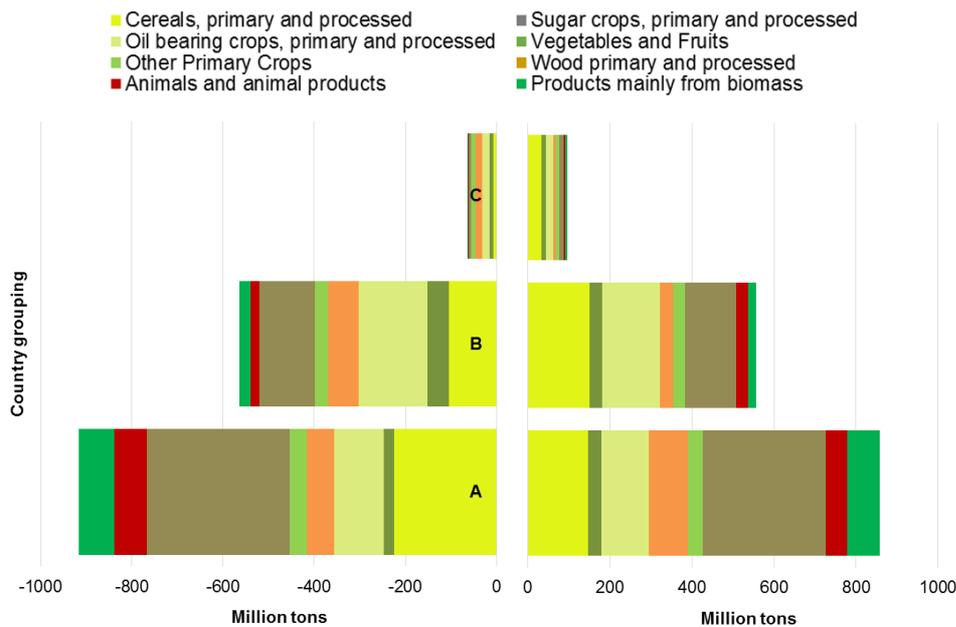


Fig. 11
Exports (to the left of the y axis) and imports (to the right of the y axis) by biomass category and main country grouping in 2010 in Megatons (Mt)
Data Source: Schaffartzik et al., 2014

In 2010, country grouping A was a net exporter of biomass while groupings B and C were net importers. However, if we examine the different types of biomass traded, we find that the role of each grouping as a global supplier or consumer varies by type of biomass (Figure 11).

Grouping A supplies cereals, the most important single source of food supply in the majority of countries, to groupings B and C. This pattern is critical for food security in groupings B and C, as these countries are dependent on world markets for their local food availability. Price peaks or export bans have a strong influence on these countries, as became apparent during the food crises of 2008 and 2011 (Moseley et al., 2010). Grouping A is also a global supplier of fodder crops and pulses.

Net exports from grouping B of sugar crops, oil bearing crops, and vegetables and from groupings B and C of fruits, fibres, and other crops are the basis of the net imports of grouping A. While grouping A is a global supplier of food staples, regions B and C are suppliers of luxury foods such as vegetables and fruits, while meat and animal products flow from grouping A mostly to grouping B. Figure 11a demonstrates the legacies of the second food regime, where food aid and subsidized food production from rich to poor nations dominated the global trade flows of biomass (Friedmann and McMichael, 1989).

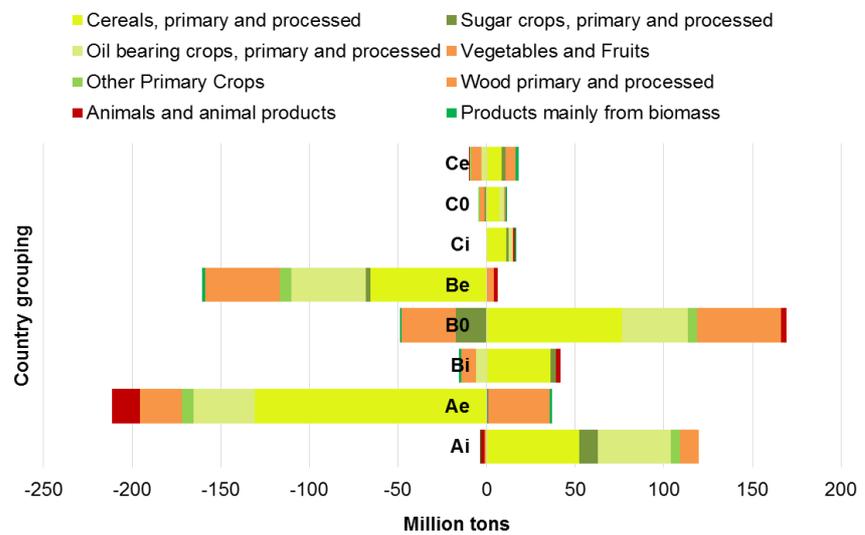


The overall pattern of grouping C as a net importer of biomass may seem to contrast with the description of unequal exchange in the context of food regime theory. According to this conceptual approach, poor countries increasingly export primary goods mostly to industrialized countries that lack fertile soils and ‘expand’ their territories through long-term land acquisitions abroad (McMichael, 2013b). But a more detailed look reveals that some export crops have undergone massive growth, while the dependency on staple crop imports remains.

An expansion of markets in these poor countries can help to overcome temporary problems of food supply, but the same market expansion often occurs at the cost of smallholders and other marginalized segments of the population (Pokorny et al., 2013). It is questionable whether the expansion of market-oriented agriculture in these countries can secure long-term food security and sovereignty, which the corporate food regime has failed to deliver.

Overall, grouping C has a comparably low level of integration into global markets for biomass, as biomass imports correspond to 2% of biomass DE, and exports correspond to 1% (19% and 20% for the A grouping). The ongoing market integration of the countries in grouping C supports the hypothesis that until now, ‘non-participating’ countries in world trade are those regions where new land-grabbing conflicts are sparked (see e.g., the Land Matrix Global Observatory, 2015).

Fig. 12
Net trade flows (net exports to the left of the y axis and net imports to the right y axis) by biomass category and country sub-grouping in 2010 in Megatons (Mt)
 Data Source: Schaffartzik et al., 2014



Within the main groupings, we can again distinguish the net exporting countries from the net importing ones fairly clearly for grouping A and B (Figure 12). It may be surprising that grouping B0 has higher net imports than grouping Bi, which is explained by the fact that this grouping is home to 10 times as many people as Bi, reducing the per capita rates to a third of the values in grouping Bi.

The exports of fruits and oil-bearing crops from grouping Ce are almost negligible at the global scale, although relevant in terms of the overall biomass availability in these countries. The importance of these crops at the local level and the dynamics of the production volumes of these crops can be linked to changes in food security



and as a consequence to potential conflicts related to changes in agricultural production. We will address these issues in the case studies.

An indication of the focus on production for export is the fact that the larger the biomass production in these countries is, the larger the biomass exports tend to be: In contrast to the other country groupings, the three net exporting sub-groupings *Ae*, *Be*, and *Ce* exhibit a fairly strong correlation between biomass extraction and biomass exports (**Figure 13**).

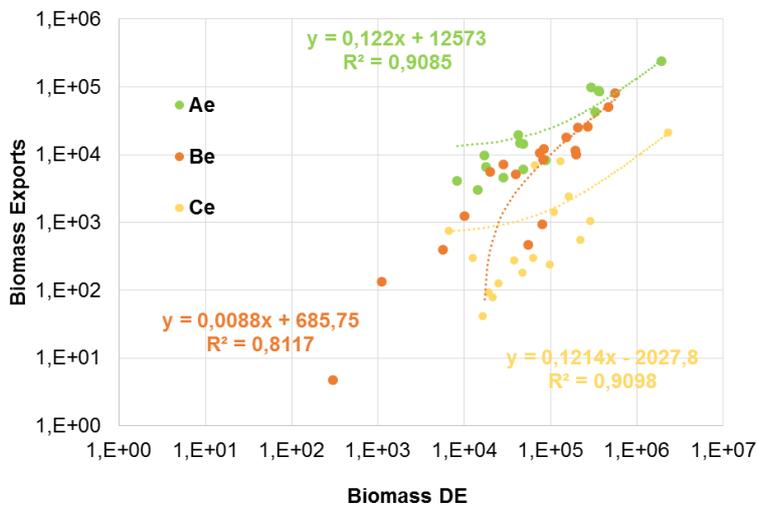


Fig. 13

Biomass domestic extraction (DE) on the x axis in kilotons and biomass exports on the y axis in kilotons in a log-log depiction for the countries in the net exporting sub-groupings in 2010. Each data point represents one country. The R^2 value was calculated for the linear relationship described by the respective equations.

Data Source: Schaffartzik et al., 2014

4

Threats to food sovereignty and the potential of social conflicts

4.1 Food self-sufficiency and international trade

The following section relates biophysical patterns of biomass extraction and trade to drivers of social conflicts arising from the rapid and market-oriented development of agriculture in the global South. Conflicts in 2008, for example, were sparked when food import dependent countries in the global South could not meet the minimum calorific requirements for their populations via global grain markets. Next to such insufficient access to global markets and associated distributive failures, socio-environmental conflict may also be related to the form of agricultural production. The conflicts surrounding land grabbing are an example as well as those which are evoked by the socio-environmental impacts of agricultural intensification (e.g., leaching of pesticides and fertilizers and land degradation).

Agricultural production practices may undermine local livelihoods of smallholders, peasant communities, indigenous groups or transhumant communities. Where conflicts become manifest, this is due to a multitude of social, political, cultural, economic, and biophysical factors. Even where conditions with high conflict potential are given, the government or another actor may be able to suppress the conflict as the example of Indonesia (**Chapter 5.1**) shows. The biophysical patterns of biomass extraction and trade discussed in the following must therefore be understood as providing one set of drivers of socio-environmental conflict potential which may be enforced or lessened by other factors.

Between 1962 and 2010, internationally traded biomass increased from less than 0.3 Gt to 1.4 Gt, a nearly 5-fold increase from 3% to 8% of total biomass extraction (**Figure 5**). This surge in trade illustrates how the corporate food regime increasingly connects remote places through long value chains. The related



expansion of corporate structures in global trade is reflected in the increasing influence of business in the political-institutional context (McMichael, 2011).

As the corporate food regime has developed, perceptions of how food security might be achieved have changed. In post WWII development, national food security was central and agricultural commodities were exempt from GATT. The Uruguay round (1986-1994), in which central WTO regulations on agriculture were negotiated and confirmed, redefined food security as obtainable via internationally managed market relations (McMichael, 2006). These international market relations are interpreted to offer the possibility of overcoming domestic shortages in food supply via imports and of producing agricultural products where this can be done at the lowest economic (and by extension environmental and social) cost whilst simultaneously providing revenue for exporting nations. There has, however, also been widespread critique of the corporate food regime as export-oriented agricultural production increasingly threatens small-scale farming and the associated food production and income for rural communities, especially in the global South (Godfray et al., 2010a; GRAIN et al., 2014; Pokorny et al., 2013). Biomass-based products, which serve the elementary purpose of feeding a country's population, are important traded commodities and sources of revenue. These two uses of biomass, food or export, often directly and indirectly compete with one another in a manner strongly linked to the potential for social conflict (Hendrix and Brinkman, 2013; Messer and Cohen, 2006).

The focus on agricultural production for export may threaten both food security and food sovereignty. Food security is commonly measured as the availability of food calories for a given population and is the result of food availability, access, utilization, and the stability of food supply. Any one of these factors can threaten food security. Whether food calories stem from domestic production or imports may influence food security if it impacts one of the aforementioned factors, e.g., if access to international food markets is more limited than access to subsistence agriculture previously was.

The claim to not only consider food security but to strive for food *sovereignty* postulates the right of people to choose their own food systems. Food sovereignty may be threatened, for example, if multinational corporations and business practices compete with smallholders over fertile lands in an asymmetric network of power relations. It expands the food security question of '*how much is available for whom?*' to include '*how are agricultural products produced and who decides this?*'

In the following section, four different factors which may threaten food security are examined empirically:

1. Food import dependency (Moseley et al., 2010) refers to a country's dependency on the international market in providing the necessary calories for its population. Food import dependency may become a risk to food security when bans in exporting countries or price peaks increase costs for importing nations.
2. Competition between the use of cereals for human food and animal feed may reduce the availability of calories for direct human consumption through the



lower EROI of animal products compared to crops that may be directly consumed by humans (Erb et al., 2012b).

3. Provisioning difficulties (Lipinski, 2013; Gustavsson et al., 2011) are defined as the amount of the commodity in question lost during the year at all stages between production and household consumption (FAOSTAT, 2014). While in industrialized countries the largest shares of food are lost during the final stages of the life cycle (i.e., after food was purchased by end-consumers), the largest losses in developing countries occur during the production, processing, and distribution phases (up to 90% in Sub-Saharan Africa and Latin America). Food waste and food losses made up between 120 kg/cap in South and Southeast Asia and nearly 300 kg/cap in Northern America in 2007 (Gustavsson et al., 2011).

4. Export dependency refers to countries with agricultural systems that export significant shares of their production (Gudynas, 2010; Watkins, 1963). This export-orientation may be detrimental to the local population if export revenues are not evenly distributed, especially if import-dependency for staple crops exists simultaneously and subsistence agriculture is replaced (Borras et al., 2012; McMichael, 2011).

For our analysis of threats to food security, we investigated these four factors regarding the domestic main staples at the country level. The most important single source of food in most of the countries facing food insecurity are cereals which are also the most widely traded agricultural commodity (**Figure 6**). Globally, wheat and rice are by far the two most important cereals consumed as human food with maize coming in third: In 2009, wheat represented 45% of the cereals consumed, rice 36%, and maize 12% (FAOSTAT, 2014). We have thus classified countries into three groupings according to the cereal which is the main source of food in a country, i.e., wheat, maize or rice.

The four factors potentially threatening food security may also be observed in high-income countries with high food supply. Some EU member states, for example, import significant shares of the cereal they consume, of which a large share may be used to feed livestock. Neither this import dependency nor limited food sovereignty have provoked any major discussion in the EU, although some concerns have been recently voiced (Franco and Borras, 2013). These focus on the almost exclusively corporate-based agricultural development in the EU which may undermine local and/or sustainable food systems. Since other factors minimize the potential for conflict, the countries of grouping A (see **Table 2** in **Chapter 3**) have mostly been excluded from the following analysis, except where they are helpful to understand the following conflict patterns.

4.2 Patterns of maize production and consumption

Figure M1 provides an overview of the seven countries with the highest import dependence for maize and in which maize is the single most important staple crop. Of these, Lesotho, Swaziland, Zimbabwe, Namibia, and Kenya, all located in Sub-Saharan Africa, import more than 40% of their domestic food supply, either

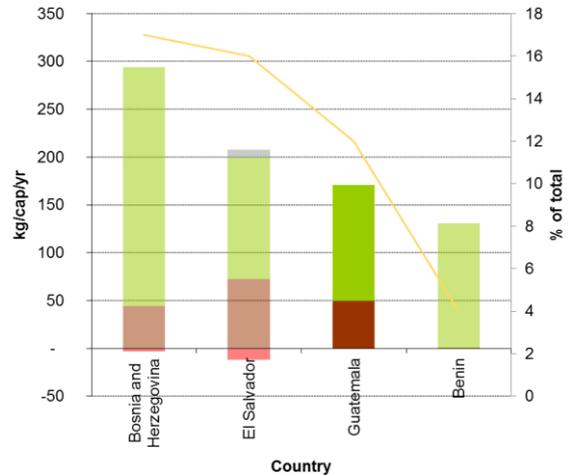
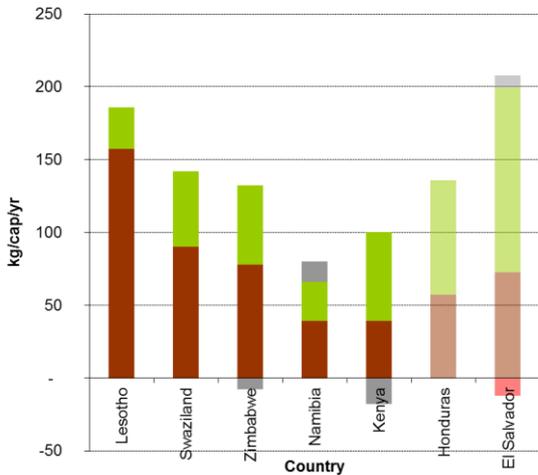


as commercial imports or delivered as food aid (del Ninno et al., 2007). While food aid is a crucial immediate response to food crises, it may, if it has to persist in the long-run, render a country import dependent and vulnerable to dumping of heavily subsidized food from major agricultural producers (Friedmann, 1982).

Not only import but also export dependency may bear conflict potential. Paraguay and South Africa export significant shares of their domestic production of maize (**Figure M4**) and in Paraguay significant wastes of 300 kg of maize per capita and year through provisioning (mostly through post-harvest losses) put additional pressure on domestic food security (**Figure M3**). **Figure M2** shows that Bosnia and Herzegovina, El Salvador, Guatemala, and Benin feed significant shares of their maize production to their livestock (amounts corresponding to at least 85% of maize used for food). The share of animal products in the domestic diets of these countries, however, is comparably low (secondary y axis in **Figure M2**). In the case of food-insecure Guatemala, the competition between the uses of maize for fodder and for directly feeding people points to high conflict potential.

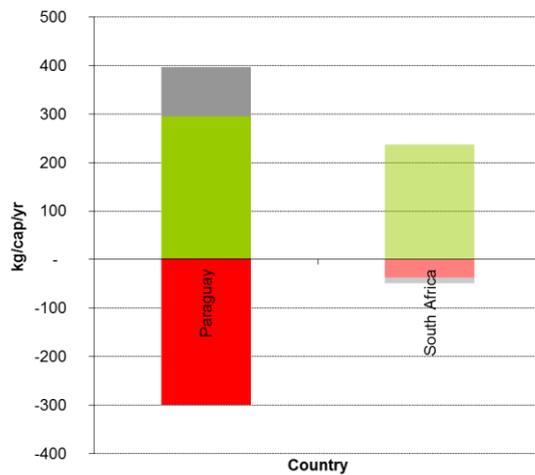
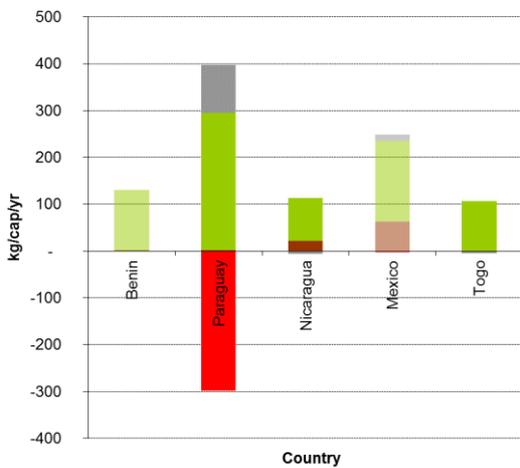


Out of a total of 25 countries in which maize was the most important cereal food source, 16 (64%) fall into one or more of the categories which reflect conflict potential with regard to providing for basic dietary requirements. Source of all data: FAOSTAT, 2014



M1 Import dependency: Countries in which maize is the most important cereal food source in terms of calories provided per capita and imports correspond to more than 1/3 of domestic supply; in the 4 leftmost countries, imports exceed domestic production

M2 Food vs feed: Countries in which maize is the most important cereal food source in terms of calories provided per capita and use for feed is larger than or similar (lowest: 84%) in size to use for food



M3 Difficult provisioning: Countries in which maize is the most important cereal food source in terms of calories provided per capita and waste corresponds to one quarter or more of amount supplied for food

M4 Export dependency: Countries in which maize is the most important cereal food source in terms of calories provided per capita and an amount corresponding to more than 10% of production is exported

Data Source: FAOSTAT, 2014. Solid bars indicate food insecure countries (grouping C – kcal/cap/day lower than 90% of the global average and low income), transparent bars display countries in grouping B (kcal/cap/day at least 90% of global average and low income). All values on the vertical primary axis in kg/per capita/year, the secondary axis in Figure M2 displays the share of t of animal products in human nutrition (tons per ton). Countries are grouped from high to low levels of conflict potential from left to right on the horizontal axes. Please note that different scales are used on the vertical axis.

- Production quantity (kg/cap/yr)
- Export quantity (kg/cap/yr)
- Stock variation (kg/cap/yr)
- Import quantity (kg/cap/yr)

4.3 Patterns of rice production and consumption

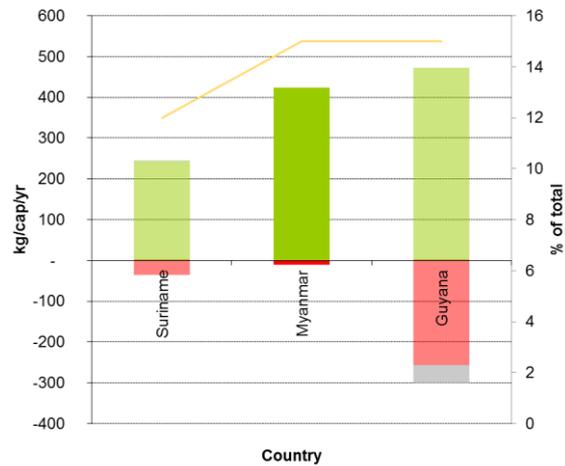
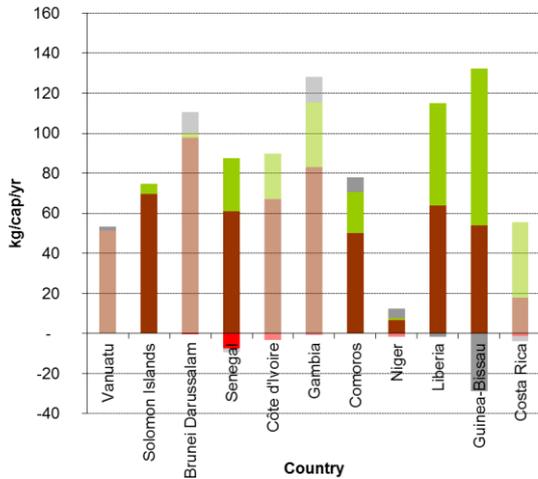
Rice is the most important staple crop in many East and Southeast Asian countries and also in some Sub-Saharan and a few Latin American countries. Out of a total of rice-dominated 35 countries, 11 countries are classified as import dependent (i.e., more than one-third of domestic supply stems from imports), out of which 6 countries are classified as food insecure (**Figure R1**). Brunei Darussalam has one of the highest GDP/capita globally and can 'counterbalance' the low domestic food production with high revenues from oil and gas exports.

Most countries of groupings *B* and *C* do not, however, have such a de-escalating mechanism. Gambia and Côte d'Ivoire, belonging to grouping *B*, were severely affected by the global food crisis in 2008 and also suffer from periodic food insecurity (Moseley et al., 2010). On a global level, rice only plays a minor role as livestock feed, but in Suriname, Guyana, and Myanmar, significant shares of rice are fed to the monogastric and ruminant livestock (**Figure R2**).

If not only crop residues but also the grains as such are fed to livestock, competition between food and feed may arise, particularly if the provisioning infrastructures are additionally inefficient. In Suriname, Guyana, and Myanmar, waste corresponds to between 30% and 44% of domestic supply (**Figure R3**). Guyana and Suriname are also major rice exporters (**Figure R4**), underlining that these economies have highly specialized agricultural sectors. During the last years of high international staple crop prices, this development path secured foreign revenues through exports, but in times of low world market prices, these important sources of income may decrease (Barbier, 2010; Watkins, 1963).

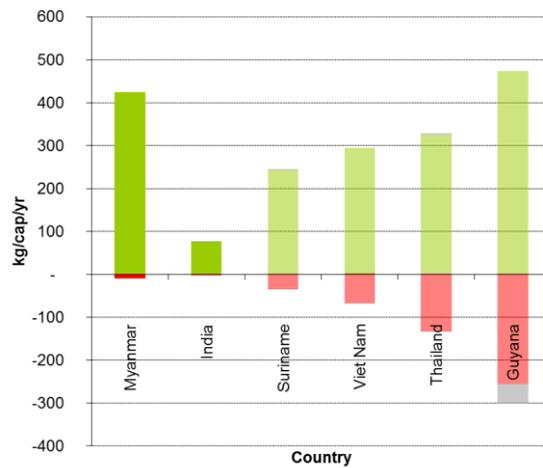
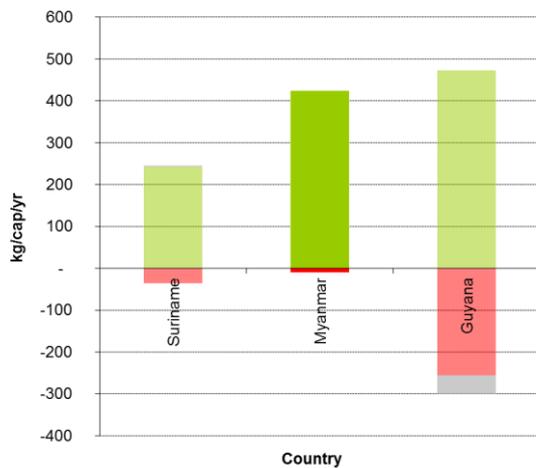


Out of a total of 35 countries in which rice was the most important cereal food source, 16 (47%) fall into one or more of the categories which reflect conflict potential with regard to providing for basic dietary requirements. Source of all data: FAOSTAT, 2014



R1 Import dependency: Countries in which rice is most important cereal food source in terms of calories provided per capita and imports correspond to more than 1/3 of domestic supply; in the 9 leftmost countries, imports exceed domestic production

R2 Food vs feed: Countries in which rice is the most important cereal food source in terms of calories provided per capita and use for feed is larger than or similar (lowest: 53%) in size to use for food



R3 Difficult provisioning: Countries in which rice is most important cereal food source in terms of calories provided per capita and waste corresponds to one quarter or more of amount supplied for food

R4 Export dependency: Countries in which rice is most important cereal food source in terms of calories provided per capita and an amount corresponding to more than 10% of production is exported

Data Source: FAOSTAT, 2014. Solid bars indicate food insecure countries (grouping C – kcal/cap/day lower than 90% of the global average and low income), transparent bars display countries in groupings A (kcal/cap/day higher than the global average, high income) or B (kcal/cap/day at least 90% of global average and low income). All values on the vertical primary axis in kg/per capita/year, the secondary axis in Figure M2 displays the share of t of animal products in human nutrition (tons per ton). Countries are grouped from high to low levels of conflict potential from left to right on the horizontal axis. Please note that different scales are used on the vertical axes.

- Production quantity (kg/cap/yr)
- Export quantity (kg/cap/yr)
- Stock variation (kg/cap/yr)
- Import quantity (kg/cap/yr)

4.4 Patterns of wheat production and consumption

Wheat is the most widely grown and consumed cereal at the global level, with 653 Mt produced in 2010. That same year, around 22% of the global wheat production was traded, making wheat by far the most widely traded agricultural commodity. Out of a total of 97 countries in which wheat was the most important cereal food source, 53 (55%) imported more wheat than they produced, compared to 9 out of 35 (26%) for rice and 4 out of 25 (16%) for maize.

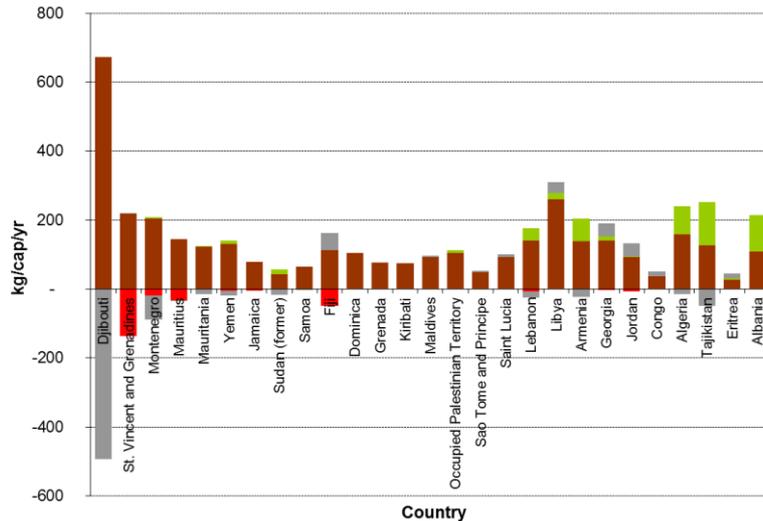
Figure W1 shows that 27 import dependent countries fall into country groupings *B* and *C*, making them more vulnerable to international price peaks than the countries in grouping *A*. The countries depicted in the columns on the left in **Figure W2** all have comparably high wheat production and low wheat imports and significant shares of available wheat are fed to livestock. In contrast, the countries depicted in the columns on the right import significant amounts of wheat and also feed more than 10% of their domestic wheat supply to livestock, thus compromising food security.

Losses of wheat, mainly during the production stage, are higher than 15% of domestic supply in 7 countries of grouping *B* (**Figure W3**). These losses are especially relevant in countries with very high levels of wheat production in this grouping: Bulgaria, Kazakhstan, Uruguay, and Turkmenistan each produced more than 600 kg of wheat per capita in 2009. In Djibouti, a country highly dependent on food imports, high levels of waste aggravate domestic food insecurity.

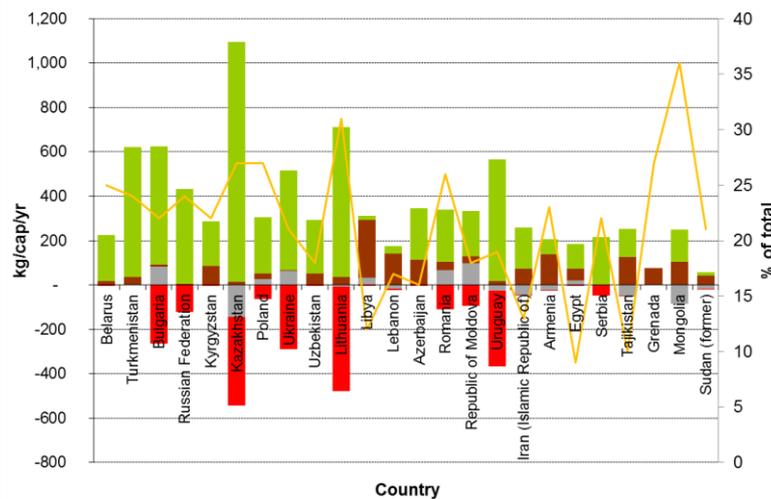
Figure W4 shows a number of countries in which wheat is the most important cereal food source in terms of calories provided per capita and which have no (or negligible) domestic wheat production. Nonetheless, Montenegro, Jordan, Yemen, and the occupied Territory of Palestine exported more than 25% of the domestic production of this commodity. Overall, a total of 49 out of 97 countries (50%) are 'export dependent' in a very broad sense, i.e., they export more than 25% of their wheat production.



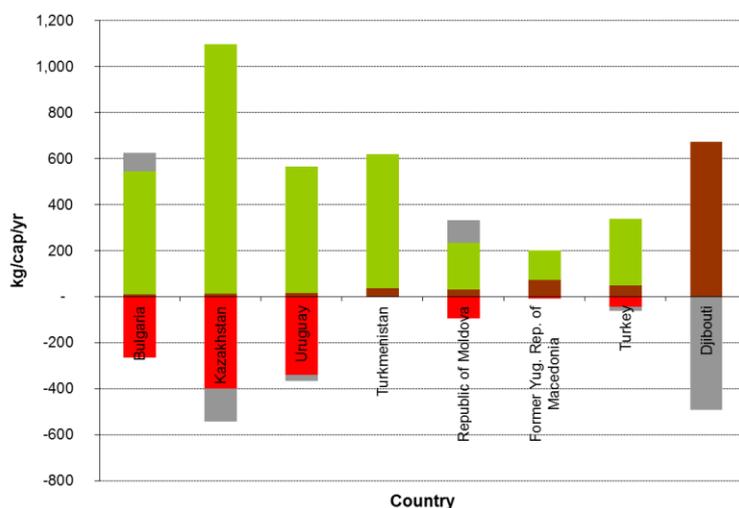
Wheat was the most important cereal food source in 97 countries. The following Figures (W1 – W4) only show data for countries in groupings B and C. Source of all data: FAOSTAT, 2014



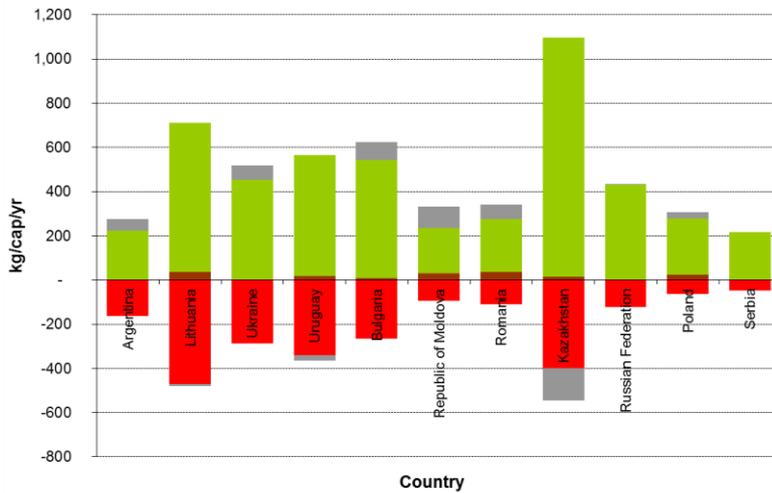
W1 Import dependency: Countries in which wheat is the most important cereal food source in terms of calories provided per capita and imports correspond to more than 1/2 of domestic supply; Countries from Saint Vincent and the Grenadines to Albania are grouping B, Djibouti to Congo are in grouping C. Total number n = 53 (55%)



W2 Food vs feed: Countries in which wheat is the most important cereal food source in terms of calories provided per capita and use for feed is larger than or similar in size (cut-off at 10%) to use for food. Countries from Belarus to Serbia belong to grouping B, Tajikistan to Sudan (former) are in grouping C. Total number n = 55 (57%).

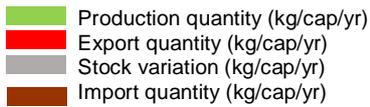


W3 Difficult provisioning: Countries in which wheat is the most important cereal food source in terms of calories provided per capita and waste corresponds to 15% or more of amount supplied for food. Countries from Bulgaria to Turkey belong to grouping B, Djibouti is in grouping C. Total number n = 15 (16%).



W4 Export dependency: Countries in which wheat is the most important cereal food source in terms of calories provided per capita and an amount corresponding to more than 25% of production is exported. Countries from Montenegro to Poland belong to grouping B, Yemen and the Occupied Palestinian Territory to grouping C. Total number n = 38 (39%)

Data Source: FAOSTAT, 2014. All values on the vertical primary axis in kg/per capita/year, the secondary axis in Figure W2 displays the share of t of animal products in human nutrition (tons per ton). Countries are grouped from grouping B to grouping C, and from high to low levels of conflict potential from left to right on the horizontal axis. Please note that different scales are used on the vertical axes.



For rice, maize, and wheat, the factors discussed above may aggravate conflict potential. However, socio-environmental conflicts result from an interplay of economic, social, and political factors, which can mitigate or enforce this conflict potential linked to agricultural production. Export-oriented agricultural production appears to contribute to conflict when decreasing world market prices for the exported goods reduce foreign revenues, or when land use competition between staple and export crops puts smallholders at a severe disadvantage.

Increasing land prices, disregard for customary land rights in commercial agricultural production or increasing land concentration may also trigger conflicts if there are no adequate compensatory mechanisms for the affected groups of the population. High dependence on food imports may indicate high conflict potential when it is the result of the interplay between a massive expansion of export crops in the same country, with benefits and burdens distributed disproportionately between different parts of the population.

Competing claims on limited land resources, created by unequal power relations between different social groups, often break up between the promotion of local livelihoods through subsistence farming and the production of agricultural goods for urban areas or international trade. If one or more of the four conflict factors appear in countries facing food insecurity, it is more likely that this is leading to conflicts than in countries with resilient food systems.



5

Country case studies

The following chapter provides three different country case studies, one from Southeast Asia (Indonesia), one from Latin America (Paraguay), and one from Sub-Saharan Africa (Ethiopia). This selection allows us to specifically examine three countries with increasing exports of primary agricultural products. Paraguay and Indonesia are examples of countries with a history of biomass exports and Ethiopia is considered to have considerable potential for further expand its biomass production and exports.

5.1 Power over land: The expansion of oil palm plantations in Indonesia⁹

The EJOLT environmental justice atlas currently documents 27 cases of environmental conflict in Indonesia, out of which 24 are related to biomass extraction and/or are land conflicts. The following case study of the expansion of oil palm plantations documents some of the history of control over land in Indonesia during the second half of the 20th century. While the significance of limited access to land in sparking conflict is commonly considered, the development of plantation agriculture in this Southeast Asian country further shows that limiting access to land may also be a strategy for avoiding (or postponing) conflict as well as a reaction to perceived injustices in prevailing forms of land control and use.

5.1.1 Indonesia's booming palm oil production

In terms of the quantity consumed, palm oil is one of the most important edible vegetable oils. It is used both for cooking and as an ingredient in many processed foods. More than 50% of palm oil produced globally is, however, used for industrial purposes, mainly in soaps and cosmetics but also increasingly as a feedstock for the production of agrodiesel. Palm plantations are considered the fastest growing monoculture in the world (Gerber, 2011) and almost half of global

⁹ Chapter 5.1 was written by Anke Schaffartzik, Alina Brad, Melanie Pichler, and Christina Plank

growth between the early 1960s and 2010 occurred in Indonesia (6 million hectares). In the two decades between 1991 and 2011 alone, oil palm plantations expanded from an area corresponding to less than 0.5% to more than 3% of Indonesia's land area (FAOSTAT, 2014). Plantation expansion is linked to environmental burdens such as significant risks to ecosystems and biodiversity (Fitzherbert et al., 2008; Koh and Wilcove, 2008) and impacts on climate change through deforestation and drainage of peat lands (Fargione et al., 2008; Germer and Sauerborn, 2008; Reijnders and Huijbregts, 2008). Plantation expansion infringes upon other types of land use and excludes groups of people from the land. The dispossession of people from their livelihood resource has often been violent and associated with social conflict (Colchester et al., 2006; Colchester and Chao, 2013; Larsen et al., 2014; Marti, 2008).

In spite of the socio-ecological consequences, oil palm plantations and the production of palm oil grew exponentially from the early 1960s onwards: Less than 0.07 million hectares (Megahectares) per year (Mha/yr) were harvested in the early 1960s, increasing to approximately 1.7 Mha/yr around the time of the Asian economic crisis in 1997/1998 and to approximately 6 Mha/yr in 2012 (**Figure 5.1**). The plantation expansion can be considered to have been instrumental to the ongoing process of political and economic change in Indonesia.

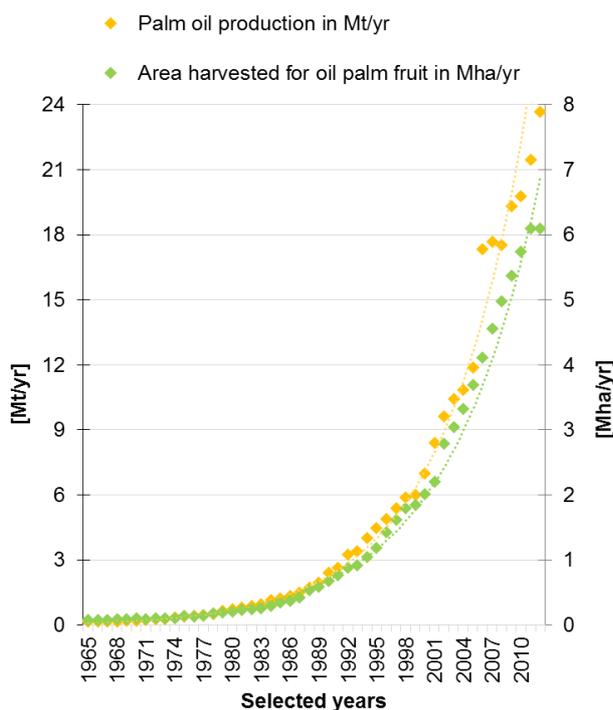


Figure 5.1

Palm oil production in million tons (Megatons) per year (Mt/yr: primary y axis) and area harvested for oil palm fruit in million hectares (Megahectares) per year (Mha/yr: secondary y axis) in Indonesia between 1965 and 2012. The harvested area has not been corrected for multi-cropping and may be larger than the area actually covered by oil palm plantations. The dashed lines represent the fitted exponential curve for each indicator

Data Source: FAOSTAT, 2014

5.1.2 Central control over land through plantation expansion

In the 1960s, the Indonesian economy was still strongly based on the extraction and use of biomass resources, especially wood and primary crops, which accounted for over 70% of total domestic extraction (**Figure 5.2**). The New Order

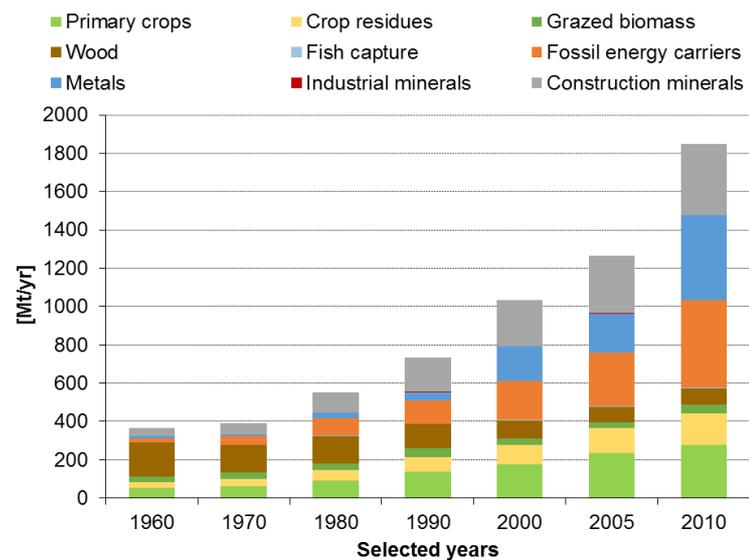


regime of General Suharto, which came to power following a bloody military coup in 1965, sought to establish its own brand of central government control over land. This entailed reversing changes which had been set in motion under Indonesia's first president, Sukarno.

His post-colonial land politics had involved the nationalization of land held privately by individuals or international companies and the redistribution of this land to landless peasants. The Basic Agrarian Law (BAL) was adopted as a core of this land reform program and introduced customary rights as the legal basis of agrarian law (Republik Indonesia, 1960, Article 5). In order to avoid the concentration of land in the hands of a few, the maximum land area that could be managed by an individual or a family was limited to between 5 and 20 hectares (Republik Indonesia, 1960b). Simultaneously, however, a right to exploitation had been introduced which permitted companies to own more than the maximum land area (Republik Indonesia, 1960, Article 29). Thus, the BAL did allow for the continuation of plantation agriculture and was not an obstacle to its subsequent expansion.

Figure 5.2
Domestic extraction in Indonesia
between 1960 and 2010 by material
category in million tons (Megatons)
per year (Mt/yr).

Data Source: Schaffartzik et al., 2014



Suharto's New Order broke violently with the land reform: Not only did the political developments toward land redistribution come to a halt but all radical peasant movements were banned. Members and alleged sympathizers of the Indonesian Communist Party and related peasant organizations (e.g., the Indonesian Peasant Front) were killed, people were removed – often violently – from their land, and large segments of the population were categorically excluded from future land-use decisions (Farid, 2005; Peluso et al., 2008).

Besides declared agricultural land, with the Basic Forestry Law (BFL) of 1967, more than 70% of the Indonesian land area was declared as state forest land and control over this land was transferred to the Directorate General of Forestry. The claims of indigenous groups to some of this land were ignored and all land not covered by centrally documented property rights was declared state land. Out of

this state forest land, more than two thirds (over 90 Mha) were classified as production land, allowing for the establishment of commercial logging as a major pillar of the Indonesian economy and, in 1970, more than 140 Mt of wood (corresponding to more than one third of the country's total domestic extraction) were harvested from Indonesia's forests (**Figure 5.2**).

The dispossession of people and the classification of land, for which the BFL provided the legal preconditions, further facilitated the expansion of plantations into fallows, grasslands, scrub, and secondary forests (Colchester et al., 2006). Through the instrument of contract farming, the expansion of plantation agriculture was useful to the central government in extending its control to provinces beyond Jakarta and islands other than Java¹⁰ and, by extension, to the rural population. Smallholders were integrated into a core-smallholder scheme of plantation agriculture with plots of approximately two hectares per family, in a core-to-smallholder ratio of about 20:80 or 30:70 (Zen, Barlow, and Gondowarsito 2005). The core plantation was either state-owned or strongly tied to the central government which assisted the company in gaining access to land, by developing infrastructure, and providing subsidized capital for plantation development.

Under Suharto's New Order, oil palm plantations grew at high rates of approximately 6% per year (**Figure 5.1**) while the overall income from the agriculture sector continuously fell from over 50% of GDP in 1965 to 36% in 1976 (Pitt, 1980). Fossil energy carriers, especially crude petroleum, were becoming an increasingly important source of income: With the oil crises of the early 1970s, Indonesia significantly increased its exports of fossil fuels which accounted for 80% of Indonesia's physical exports by 1980 (Schaffartzik et al., 2014b). Revenues from petroleum increased the budget of the Indonesian economy and, along with long-term loans procured by the government, allowed for greater financial investments into agriculture. With the goal of decreasing the country's dependency on imports and aid to provide rice, its most important staple¹¹, a 'Green Revolution'¹² (promoted in Indonesia by the World Bank and the Asian Development Bank) was implemented.

Following requirements made by the loan-granting banks, the higher outputs of agricultural commodities (also see **Figure 5.2**) were almost exclusively dedicated to export: While only 2% of Indonesia's physical exports were of biomass origin in 1960, this share rose continuously to 10% by 1990 (Schaffartzik et al., 2014b). High levels of domestic and foreign demand for palm oil provided an incentive for

¹⁰ Until 1980, oil palm plantations were essentially confined to three provinces in northern Sumatra where they followed in the trodden paths of colonial rubber plantations (Kementerian Pertanian Republik Indonesia, 2013).

¹¹ For a general discussion of the relevance of import-dependence for staple crops, see also Section 3 of this report.

¹² The 'Green Revolution' was essentially aimed at establishing a high-input high-output agricultural system in which higher yields were to be achieved through the use of fertilizers, pesticides and herbicides, agricultural technology, and new crops types along with efficient management techniques.

higher production levels while higher yields and extensification of palm oil production made the maintenance of the (foreign) sales market a necessity. The expansion of plantations continued on the island of Sumatra (see footnote 11) and the government increasingly sought to secure investments by national and foreign private-owned conglomerates in more remote provinces. From the mid-1980s on, the contract farming scheme was merged with the government-sponsored transmigration resettlement program (*transmigrasi*): Peasants and landless people from the densely populated islands of Java and Bali were moved to the Outer Islands of Kalimantan, Sumatra, and Sulawesi where they were provided with land for oil palm development under the contract farming scheme (**Figure 5.3**). This development was instrumental in bringing the resource-rich, fertile, and only sparsely populated areas of the country under central control (McCarthy et al., 2012).

5.1.3 Continued expansion under greater district-level control

The reforms which were implemented in Indonesia in the wake of the Asian financial crisis and the fall of Suharto's authoritarian regime in 1998 were directly relevant for the continued expansion of oil palm plantations. Decision-making power with regard to land use was transferred from central state institutions to the district level. Regional expressions of discontent (e.g., separatist movements in Aceh and West Papua) and the pressure of the International Monetary Fund and the World Bank for structural adjustments following the Asian crisis triggered this decentralization initiative (McCarthy, 2004).

Plantation permits which the district governments were allowed to release following the reforms (Ministry of Agriculture, 2007, Article 17) became an important source of income at the subnational level while most revenues generated from palm oil production (e.g., export taxes) remained with the central government.¹³ The district government now had decision-making power in matters of land lease, of compensation for local landowners, and in plantation structure. Additionally, it is common for members of district governments to be shareholders in agribusiness companies or land brokers and to thus have additional influence through controlling access to land.¹⁴

Figure 5.3

Map of Indonesia (source of outline: Wikimedia Commons, Golbez CC BY 2.5) with share of palm oil production by province in total Indonesian palm oil production in 1975 and 2011.

Data Source: Kementerian Pertanian Republik Indonesia, 2013



■ Share in 1975 ■ Share in 2011

¹³ Interview with Sawit Watch, Bogor, 3 December 2013.

¹⁴ Interview with an activist, Bogor, 5 December 2013.



During this period, the previous core-smallholder scheme of plantation agriculture was replaced by a so-called partnership model with which the Indonesian government sought to attract private investment in the plantation sector. The core company now held approximately 80% of the jointly managed plantation area and only 20% was allocated to smallholders (McCarthy et al., 2012).

Unlike in former contract farming schemes, the companies were entitled to negotiate access to and integration of land into the plantation structure directly with local landowners (Republik Indonesia, 2004, Article 9). Dividends of the plantation's profit, promised in return for the loss of land, attracted landowners to this scheme (Li, 2011). Between 2001 and 2010, the number of smallholders tied to plantation companies as contract farmers increased by 140% (Badan Pusat Statistik, 2012).

During the reform period, biomass resources contributed decreasing shares to total material extraction in Indonesia: From over one half of domestic extraction in 1990, biomass decreased to under one third by 2010 (**Figure 5.2**). Palm oil production, nonetheless, continued to grow at unprecedented rates (**Figure 5.1**). This growth was partially driven by an increasing domestic and foreign demand for Indonesian palm oil. Especially in the South-Eastern Asia region, this oil was one of the most important feedstocks in the production of agrodiesel (Zhou and Thomson, 2009); internationally, the growing use of other vegetable oils (rape seed, soybean, sunflower) for agrodiesel production necessitated a substitute for these oils in human nutrition and other industrial uses.

As palm oil production grew, plantations expanded farther into the Outer Islands and into economically less developed regions and districts (see **Figure 5.3**). While in 1975, almost 90% of oil palm plantation land was located in one province (North Sumatra), in 2011, the largest share of oil palm plantation area (21%) was in the Riau province (on the island of Sumatra) and 31% of all oil palm plantation area was on the island of Kalimantan (Kementerian Pertanian Republik Indonesia, 2013). Overall, out of the 6 million hectares on which oil palm plantations in Indonesia expanded between 1962 and 2012, more than 70%, or 4.3 million hectares, were planted during the last 14 years alone (FAOSTAT, 2014).

5.1.4 Competing land claims and conflicts

According to the Indonesian NGO Sawit Watch, a great deal of the expansion of oil palm plantations occurred on contested lands. During Suharto's authoritarian regime, competing claims to land were not resolved but suppressed and conflict potential with regard to land was and is generally high. That this potential becomes manifest is documented in the EJOLT environmental justice atlas. The exclusion of certain groups of people from land-use decisions was upheld during the reform period, fostering struggles to (re)claim land for other people and/or other uses. Several different claims have been made to land in the context of plantation expansion in Indonesia. They can be distinguished by the group(s) which make(s) the respective claim and by the argument on which they base their claim.



Customary land rights

Since the colonial period, customary land tenure, which is generally recognized by both the Indonesian Constitution and the BAL, was largely ignored. Customary rights were violated by several laws and regulations – especially the Basic Forestry Law (BFL, see 5.2.2.). Under Suharto, resistance to large-scale dispossession was violently suppressed. The greater political freedom of the reform period was conducive to the reassertion of the claim to customary land rights (Benda-Beckmann and Benda-Beckmann, 2010). Intense lobbying on the part of the Alliance of Indigenous Peoples (AMAN – *Aliansi Masyarakat Adat Nusantara*)¹⁵ and other civil society organizations led to a landmark ruling of the Constitutional Court in 2013 according to which forest land covered by customary rights was to be excluded from state forest land. This ruling provided indigenous people and their representatives with a recognized legal basis for an alternative mode of access to and control over land.

Social justice

The redistribution of land to peasants and landless poor has been identified as a prerequisite for social justice and food sovereignty (also see Chapter 6 of this report). In Indonesia, agrarian movements such as the Indonesian Peasant Union (SPI – *Serikat Petani Indonesia*) and the Consortium for Agrarian Reform (KPA – *Konsorsium Pembaruan Agraria*) actively lobby for a new attempt at the implementation of land redistribution as outlined in the post-colonial land reform program. During New Order, the program of the Basic Agrarian Law (Republik Indonesia, 1960), was implemented only selectively, focusing on the dispossession of people for the sake of national development. While agrarian movements were violently suppressed under New Order, the reform period reopened some political maneuvering room and brought agrarian reform initiatives back to the agenda.¹⁶ Next to lobbying in state institutions, the claim has also been pursued via land occupation and settlement projects of landless farmers.

Economic growth

International financial institutions such as the World Bank as well as the Indonesian National Land Agency call for the redistribution of land in favour of individual land titles and deem the current rate of state control over land to be excessive. The resulting free land market would, so goes the claim, lead to economic growth (e.g., World Bank, 2014). Although the agrarian movement (see above) had intensively lobbied with the central government for comprehensive agrarian reform and redistribution of land within the Land Management and Policy Development Project, funded by the World Bank, the National Land Agency has basically only issued land titles for those already using state land (Rachman, 2011). Approximately 1 million land titles were issued between 2004 and 2009

¹⁵ For more information see: <http://www.aman.or.id/>

¹⁶ Interview with KPA, Jakarta, 12 July 2011.



(Waren and Lucas, 2013), securing land tenure for some and simultaneously establishing a land market.

Environmental protection

International organizations like Conservation International or the World Wildlife Fund (WWF) call for the establishment of nature conservation reserves and wildlife corridors in Indonesia (Maddox et al., 2007) in order to protect the local and the global environment. They argue that the deforestation associated with plantation expansion must be stopped and that nature conservation in some regions requires the prohibition of agricultural and foraging activities altogether. In the past, these claims have had to be asserted by violent means: Nature reserves depend on the police, the military or private security companies to enforce boundaries and limit access. Conflicts have arisen, for example, between claims to land for ecosystem restoration and for subsistence agriculture and livelihood purposes.

The expansion of oil palm plantations in Indonesia continues to threaten rural livelihoods and cause irreversible environmental damage. The rate and degree of this expansion was largely enabled through state control over land and thus over access to resources. Government control over land in Indonesia has been instrumental not only in securing this access to resources but also in keeping the multi-ethnic Indonesian population in the 15th largest country in the world, dispersed on over 18,000 islands, under some form of central control. The expansion of plantation agriculture in Indonesia must therefore be understood not only as a potential *source* of conflict but also as a *response* to the perceived potential for conflict. The political and economic conditions under which this expansion could occur must be understood within the context of the exerted power over both nature and people which they represent. Better understanding these power relations is paramount to understanding both the causes of and potential responses to environmental conflicts in Indonesia.



5.2 The republic of soy – agricultural development in Paraguay¹⁷

The agricultural system of Paraguay has been rapidly industrializing within the last 15 years. Three main factors have primarily shaped this development: (1) the increasing market- and export-orientation of soy production, (2) growing land concentration - especially by foreign investment from neighbouring Brazil in border zones, and (3) the rapid replacement of family farming by agribusinesses (Galeano, 2012). We will describe economic and political features of the agricultural and the food system of Paraguay and how these developments evolved over the last 40 years, especially since the introduction of soybeans. We will then investigate how these developments have influenced international trade patterns of this country. We conclude this section by discussing these developments together with environmental conflicts in Paraguay.

Paraguay is a landlocked country, which is bordered and crossed by navigable rivers: the Rio Paraguay splits the country into eastern and western regions. The eastern region is officially called Eastern Paraguay ('Paraguay Oriental') and also identified as the Paranena region. The western region is officially named Western Paraguay ('Paraguay Occidental') and also called the Chaco. As the Paranena region extends towards the south and the Chaco region to the north, the country experiences both subtropical and tropical climates. Paraguay's natural regions are also defined by the regions of Paranena and Chaco. The first one is a combination of plateaus, rolling hills, and valleys and the Chaco is a vast piedmont plain. Close to 95% of Paraguay's population lives in the Paranena region, having all the major orographic types and the more predictable climate. Paraguay is surrounded by three significantly larger countries: Bolivia, Argentina, and Brazil.

5.2.1 Eating up the land – biophysical and socioeconomic characteristics of Paraguay

Paraguay is one of the smallest countries in South America. Despite intense internal migration to urban areas, it remains a country in which 40% of the population live in rural areas in 2013 (**Figure 5.6**) and its economic growth is mainly based on agriculture, the exports of which (mainly soybeans and beef) represent about 80% of all exports in physical terms. The growth of GDP in Paraguay reached annual rates up to 10% in the last decade, while in 2009 and 2012, growth rates were even negative (World Bank, 2015). Paraguay is the sixth largest producer and the fourth largest exporter of soybeans in the world. Despite the rapid economic growth, there is doubt that the economic benefits are distributed equally among the population, as a very high Gini index documents (Guereña, 2013)

Figures 5.4a and **5.4b** display the biophysical patterns of the apparent consumption (domestic material consumption DMC) in Paraguay between 1960 and 2010. **Figure 5.4a** clearly indicates that, at 90%, biomass dominates DMC,

¹⁷ Chapter 5.2 was written by Arnulfo Rojas Sepulveda and Andreas Mayer

followed by construction minerals and extremely low shares of fossil fuels and metal ores. This profile is a typical one for agrarian societies, although Paraguay's agriculture is already undergoing rapid industrialization based on the input of non-renewable fertilizers and pesticides. **Figure 5.4b** shows that Paraguay is a net exporter of biomass, while all other materials have to be net imported.

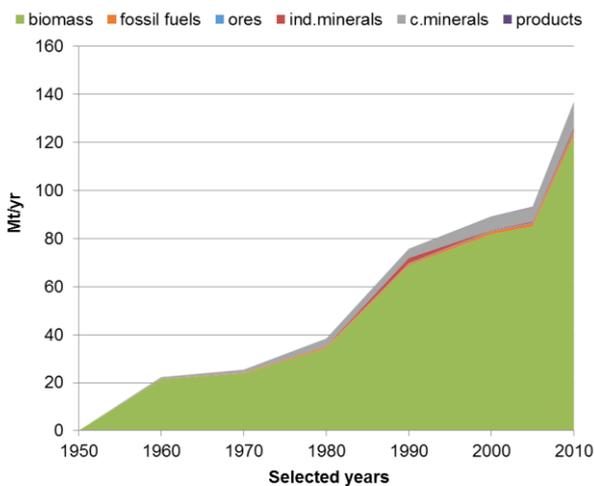


Figure 5.4a

Domestic material consumption in million tons/year from 1960 to 2010 in 10 year steps

Source: Schaffartzik et al., 2014

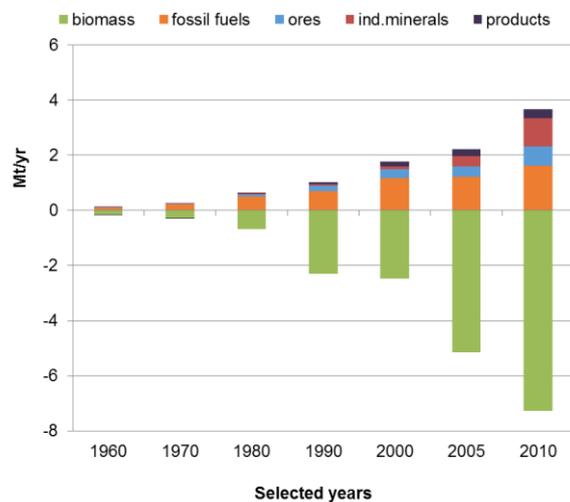


Figure 5.4b

Physical trade balance in million tons/year from 1960 to 2010 in 10 year steps

Source: Schaffartzik et al., 2014

Figures 5.5a and **5.5b** disaggregate the data shown above and reveal the main agricultural exports in 1990, 2000, and 2010 in metric tons and million USD. In terms of mass, oil seeds clearly dominated and still dominate the picture, while maize and feed stuff for animals are also among the important exported agricultural produce. Sand and gravel is the fifth largest export category and the only non-agricultural produce among the top exports. The picture is rather similar concerning economic value, where oil seeds are the most important source of foreign revenue, followed by meat (which has a higher economic value per weight than, e.g., maize) and other categories that also rank highest in physical terms. Both figures show that very few types of agricultural products dominate the exports and the entire economy in Paraguay.



Figure 5.5a

Paraguay's 6 most important export commodities in 1990, 2000, and 2010 in 1000 metric tons

Source: Schaffartzik et al., 2014

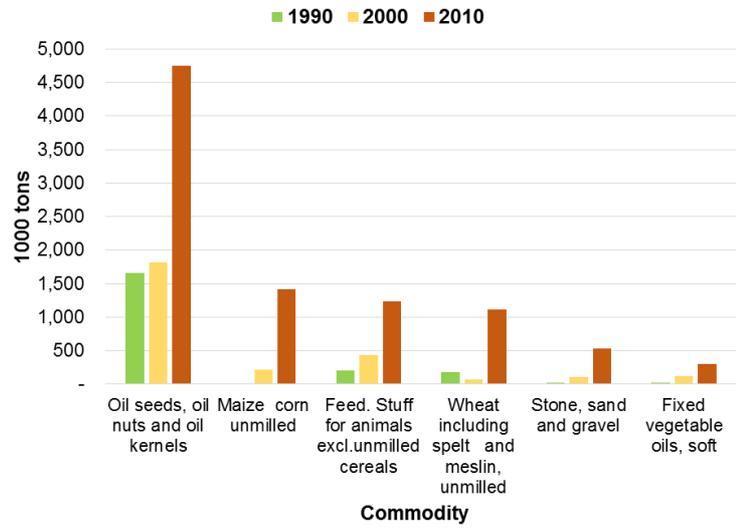


Figure 5.5b

Paraguay's 6 most important export commodities in 1990, 2000, and 2010 in million USD at constant 2005 prices

Source: Schaffartzik et al., 2014

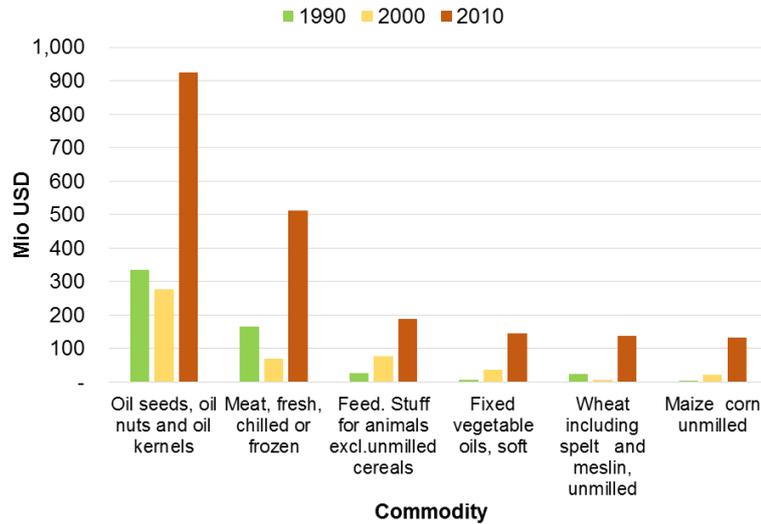
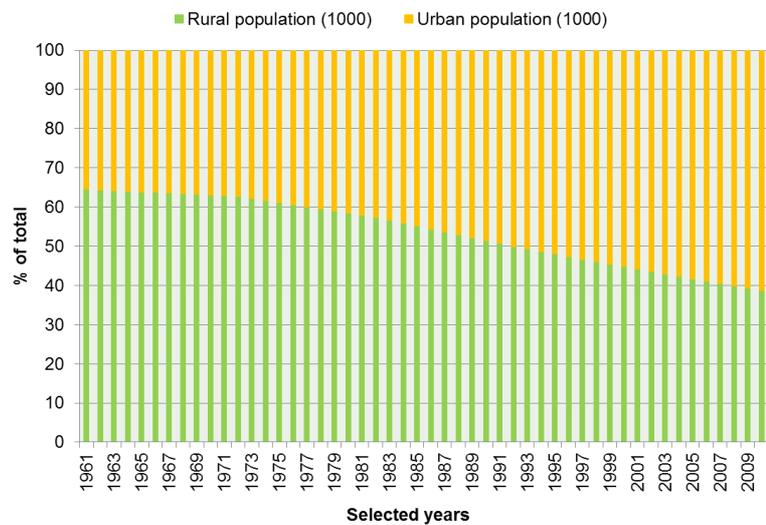


Figure 5.6

Rural and urban population in Paraguay (1961 - 2009)

Source: FAOSTAT, 2014





Wealth and development

Despite the growth achieved in the last decade, Paraguay has the lowest Human Development Index (HDI) in Latin America. In 2011, it ranked 111th Worldwide (among 186 countries) (Malik, 2013). Average per capita income is USD 3,020 which places it within the group of lower-middle income countries. High levels of poverty and inequality remain major challenges. The national poverty rate fell from 41.2% to 32.4% between 2007 and 2011 and extreme poverty fell by 23.2% to 18.0% during the same period (Guereña, 2013).

Land tenure and land concentration

The latest national agricultural census (2008) shows how unequal agricultural land distribution is in Paraguay. 80% of the agricultural land (24.5 Mha of a total of 31 Mha) is concentrated in the hands of less than 4,800 farms, representing only 1.6% of land owners. At the other extreme, 84% of farms are smaller than 20 ha and together cultivate only 4.3% of the total farmland. The concentration of land ownership has increased in recent years, as the Gini index demonstrates, increasing from an already extremely high value of 0.91 in 1991 to 0.94 in 2008. More than 180,000 families (of the approximately 500,000 families living in rural areas) own less than 10 hectares of farmland, which is considered the minimum adequate size for a rural family (Guereña, 2013).

Peasant agriculture under pressure

From mid-1950 on, the Paraguayan state defined its development model mainly on export of two products: cotton and soybeans. In order to implement and enforce this model, the expansion of the agricultural frontier was a major objective of governmental policies. Colonialization programs towards the east in Alto Paraná, Caaguazú, and later in the northern San Pedro department were coordinated by the state. Furthermore, commodification was driven by external investors, mainly by an uncontrolled penetration of medium and large Brazilian producers and multinational corporations, often at the expense of small plots of Paraguayan farmers (Riquelme, 2013).

Peasant farming and market-oriented agricultural production in Paraguay differ quite strongly, as the latter is mainly based on the cultivation of cash crops on a large scale. The traditional peasant agriculture is a diversified small-scale production aimed at supplying for subsistence and local markets. Mixed cultures of cassava, peanuts, sweet potatoes, corn, squash, beans, and other subsistence crops are grown. Bananas, guavas, mangoes, pineapples, and other fruits were once widespread among peasant farming. Inputs of fertilizers and pesticides are low and labour is provided by humans and their livestock. The forest was an additional source of food, for hunting and fishing, as well as for the collection of firewood. Large-scale agricultural production units, on the other hand, implemented a mechanized agriculture similar to that of the farmers in developed countries. Green revolution practices, mainly based on fossil fuel inputs, and recently also genetic engineering, have helped to develop the production of cash crops such as sunflower, wheat, maize, sugar cane, and canola (CAPECO, 2015).

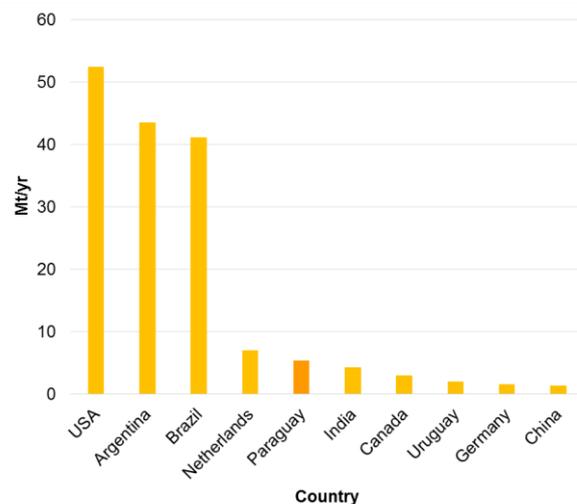


This production is driven by demands of international markets, rather than local food and raw material needs (Palau, 2007).

5.2.2 Global patterns of soy production and trade

Soy is one of the crops which expanded rapidly in many countries, especially in Latin America, and its demand is driven by the increased consumption of meat and dairy products, and the boom in the market for agrofuels. It is the crop that produces significantly more protein per acre than most other oil crops, and is used to produce animal feed, vegetable oils, industrial inputs, and biodiesel. The main producing countries in 2010 are (in declining order) the United States, Brazil, Argentina, India, China, Canada, and Paraguay, whereas the United States of America, Argentina, Brazil, Netherlands (mostly re-exports as the main European harbours are in the Netherlands), and Paraguay are also among the largest exporters of soy and soy products (**Figure 5.7**). Together with Paraguay, which is the 7th largest producer and 4th largest exporter (excluding the Netherlands), the seven largest producing countries account for the production of 93% of the global production in 2010, and the largest four exporters (excl. Netherlands) account for 84% of global exports of soy and soy products in 2010 (FAOSTAT, 2014).

Fig. 5.7
Top 10 exporters of soy and derived products in 2011 in Mt
 Data Source: Schaffartzik et al., 2014



China has become the largest importer in 2010, followed by Western Europe (24% of all physical imports), Japan, Mexico, and interestingly Indonesia, which is the most important exporter of palm oil (**Figure 5.8**). 85% of the global production of soybeans is processed to produce soy pasta (used as a fodder supplement for livestock) and soy oil, which is mostly consumed as edible oil, while the remainder is used to produce industrial derivatives such as soaps and biodiesel.

While the production and export figures for Paraguay seem low in comparison to the top three soy nations, the picture changes when the production is related to total area. Then, Argentina ranks first with 1.5 t/ha of total land area, followed by Paraguay (1.1 t/ha), the US and Brazil (with 0.9 and 0.8 t/ha², respectively).

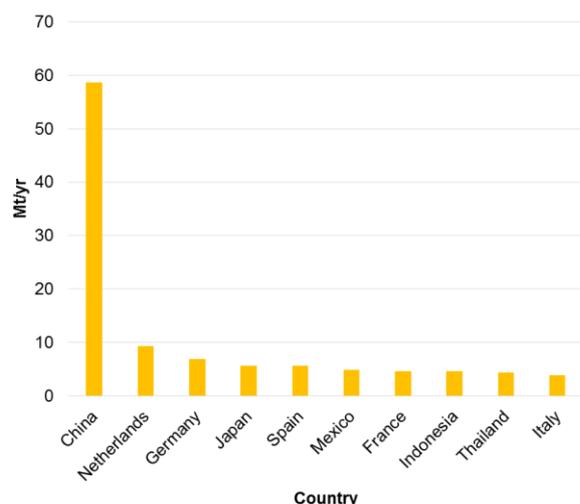


Fig. 5.8

Top 10 importers of soy and derived products in 2011 in Mt

Data Source: Schaffartzik et al., 2014

5.2.3 Soy production in Paraguay

In Paraguay, the production of soybeans for international markets began in 1970, mainly in the departments of Alto Paraná, Canindeyú, Amambay, and Itapúa. The first investors into large-scale production facilities were agribusinesses, including large Brazilian producers, who bought land in the Rio Paraná (Guereña, 2013). Brazilian labour was hired to clear the land in order to enable soybean monoculture. At the beginning of the new millennium, genetically modified seeds were introduced to Paraguay illegally, smuggled from Argentina and Brazil (Palau, 2007, 26). From the 1999/2000 agricultural season on, the annual growth of soybean acreage increased to 170,000 hectares. During the period 1995/96-2005, area under soybean cultivation grew by an average of 125,000 ha/yr. Until 2013, the area for soy production increased to over 3 Mha (**Figure 5.9**).

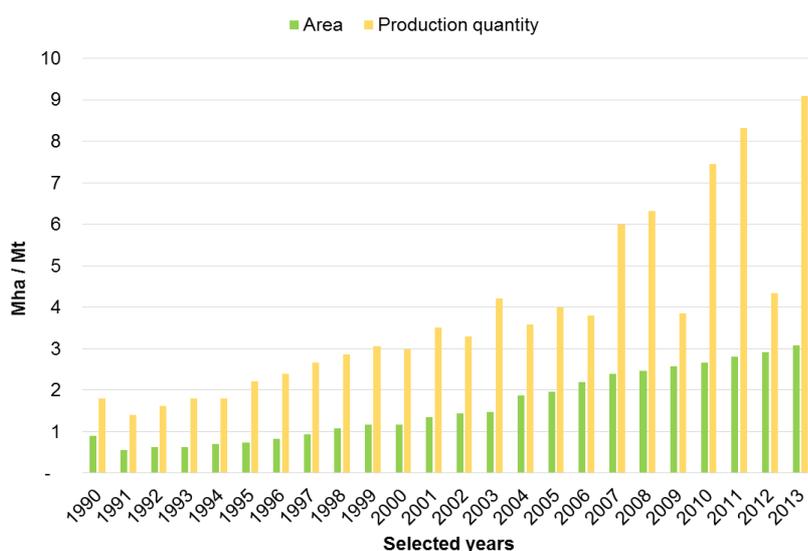


Fig. 5.9

Evolution of soybean production (in Mt) and area harvested (in Mha)

Data Source: FAOSTAT, 2014



Of the 40 Mha that form the total area of Paraguay, about 21 Mha were used for agricultural production in 2012 and 3.6 Mha were used for crop production.

Figure 5.9 shows that, between 2006 and 2013, the soybean sector underwent a strong expansion in terms of area cultivated and production quantity. The cultivated area doubled between 2003 and 2013 to occupy 80% of the total cropland (World Bank, 2014). About half of this land was formerly used for commercial cattle ranching while the other half was used by peasant and/or indigenous families (Guereña, 2013). In many cases, these families sold or rented their property or gave up their occupancy rights for soybean crops, often forced to live with the impacts of pesticides used during soy cultivation.

According to the agricultural census of Paraguay, less than 17% of total croplands are dedicated to the production of food, even considering that a fraction of soybeans are used to produce food (Guereña, 2013). Overall, there is a high dynamic in the growth of production of soy (and the livestock sector, closely linked to the soy complex), as well as in the expansion of areas under soy production in Paraguay, competing with other claims to the land, such as peasant farming or forest preservation.

The role of agribusiness and foreign investments

Soybean production essentially requires large plantations. In 2008, nearly 90% of soybeans were planted on farms of more than 100 hectares and 63% of the farms were bigger than 500 hectares. Some analysts argue that the minimum area to produce soybeans at a profitable scale is 1,000 hectares. Most of the soybean area in Paraguay is owned by Brazilians (64% nationwide and up to 80-81% in some districts of the border area) (Guereña, 2013).

Policies related to soy expansion

Between 1995 and 2000, over 70% of public expenditure on agriculture in Paraguay consisted of subsidies, most of which benefited large producers engaged in export production (e.g., fuel subsidies are almost exclusively claimed by large producers). Paraguay is the only country in Latin America in which soy exports are tax-free. Rural properties are subject to a property tax which, at an average of 0.16 USD/ha is 23.5 times lower than the average in Latin America and 45 times lower than in developed countries (Guereña 2013, 12).

According to Paraguayan Law 60/90, agribusinesses are exempt from value added tax (VAT) on all purchased goods, from tariffs and taxes on imported goods and equipment for agriculture, and from 95% of income tax during the first five years of business, extendable to ten years in areas of preferential development. The Bank of Agricultural Credit, originally established to support small production, has channelled 90% of the credits it offers¹⁸ to large farmers and cattle ranchers. Since 2005, Paraguay has a law on the promotion of agrofuels which declares the

¹⁸ Based on an interview by Guereña (2013) with Luis Rojas, Researcher at Base IS, on February the 11th, 2013.



production of raw materials for production of agrodiesel and -ethanol a *national interest* (Guereña, 2013).

5.2.4 The impacts of soy production in Paraguay on local livelihoods and the environment

The most important factor that triggers conflict with regard to soy production in Paraguay is the incompatibility of soy monocultures and small-scale farming. Even where peasants retain land, they are often forced to migrate by the detrimental environmental conditions caused by near-by large-scale soy farming. The current model of soybean monoculture thus undermines the right to a healthy existence of rural populations (Palau, 2007).

Cash crops and local livelihoods

It is nearly impossible to produce soybeans in small-scale farming because the production requires external inputs, such as chemical fertilizers and heavy machinery, and therefore capital (i.e., access to credit). This makes soy only economically viable under conditions that most family farms do not have. There are some studies that shed light on the costs and benefits of organic soy production, but such farming practices are rarely found in Paraguay (McBride and Greene, 2009). Oxfam interviewed one company in Paraguay which invests in organic soy production, the Desarrollo Agrícola del Paraguay (DAP). Farmers had to bear all the investment risk and were often found to be indebted after one bad harvest (Oxfam, 2014).

Import dependency of food and agricultural inputs

Peasant leaders emphasize that since 2000, a process of abandonment of subsistence practices in farming communities has been observed (Palau, 2007). Declining domestic food production was balanced by increasing imports of staples, which may be considered as an indication of declining food sovereignty. According to the FAO, per capita food availability in Paraguay remained relatively stable from 1989 to 2009 at a level of 2,500 kcal/cap/day, below the 2009 global average food supply of 2,831 kcal/cap/day. During the same period, food imports increased by a factor of 5 in physical terms. Between 2008 and 2011, the value of food imports increased by 48.5% from 234 to 454 million USD (data not inflation-adjusted) (Riquelme, 2013). In the districts with the largest expansion of corporate farming, a decrease in the production of staple foods such as cassava, beans, and peanuts was observed. Between 2008 and 2011, imports of chemicals inputs and equipment used for industrial agriculture increased by 40% (Guereña, 2013).

Impacts on labour

Due to its high degree of mechanization in farming operations, soy generates little employment. It is estimated that it only requires one worker per 200 hectares of crops (Guereña, 2013 based on the report of the 'Coalición Holandesa de la Soya', 2011). Most work occurs during the phase of converting cattle farms into plantations. Manual work is required to remove weeds that have become increasingly resistant to herbicides and plantations commonly contract a small number of people from neighboring communities to perform this work. These



workers have indicated in interview situations that cattle ranches provide more jobs than do soy plantations (Guereña, 2013).

Conflicts triggered by the massive expansion of GM crops

Paraguay is the country with the highest proportion (66%) of cultivated genetically modified (GM) crops.¹⁹ GM soybean seeds were first used in Paraguay in 1997, i.e., before this was legally allowed. In Paraguay, 95% of soy is Roundup Ready (RR), a GM seed that tolerates glyphosate, the active ingredient in Roundup which is a nonselective herbicide that is applied throughout the crop cycle. Monsanto holds the patent on the seed and the herbicide and earns 35 million USD annually in royalties in Paraguay. In response, a strong opposition to GM crops is developing place in Paraguay in which both the state and companies that violate environmental laws are being challenged by those affected.

Local communities often attempted to stop massive pesticide application through public demonstrations, which have led to massive repression by local authorities and the police. Attempts have been made *to criminalize protest, in order to demobilize the resistance to monocultures*. Between 2008 and 2009, 819 people were arrested for their resistance to the advance of agribusiness. In 2002, the residents of a community in Ipecuá, in the department of Caaguazú, organized road blockades to protest against fumigation. In the course of these protests, the police opened fire on a truck carrying a group of 40 people belonging to this community. Two farmers were killed and several were seriously injured (Guereña, 2013).

¹⁹ Based on Heinemann (2009); calculation of hectares in GM cultivation according to James (2007) and total arable land plus permanent crops according to FAOSTAT in 2003: See James (2007).

5.3 The balancing act: Large scale land investments to boost exports and secure food in Ethiopia²⁰

The biomass economy of Ethiopia is characterized by three key features. First, rural Ethiopia shows patterns of an agrarian society. Most people are subsistence farmers with little surplus production and consequently very small outflows, even to local markets. Although Ethiopian crop exports are increasing, they remain at a very low level of 0.8% to 3.5% of the annual crop production in the period 2001-2011. Even the aggregated five most exported crops amount to only 3%-11% of their domestic production (FAOSTAT, 2014). Second, hardly any fossil fuel-based inputs are used to intensify agricultural production. Thus, agricultural production lacks modern machinery and depends almost entirely on human labour and animal power. Additionally, only very small quantities of industrially produced mineral fertilizers are used. Third, Ethiopia is rated as being highly food insecure. According to the Food Security Risk Index²¹ for 2010 (Maplecroft, 2014), it is one of 10 countries considered to be at extreme risk, and is ranked as having the 6th highest risk out of 163 countries surveyed. Due to insufficient food production, Ethiopia needed annual food imports of about 7 Mt in the period 2009-2011 (**Figure 5.11**).

Against this backdrop, the government developed a strategy to boost exports. In recent years, large areas have been made available for land investments. While this is hardly visible in terms of absolute export flows (with 2011 as the latest available year from international statistics), in relative terms, crop exports more than tripled from 2000 to 2011, to roughly 6 Mt.

Exports related to foreign land acquisitions are directly or indirectly related to environmental conflicts in Ethiopia. This case study presents the slowly changing patterns of agricultural production, describes policies responsible for these changes, and provides an overview of environmental conflicts related to biomass exports.

5.3.1. The food system of Ethiopia: domestic production, exports and imports

Overall crop production increased from 13 Mt in 1993 to 34 Mt in 2011 (a factor 2.6 increase; **Figure 5.11**), mainly based in an increase in harvested area. Yields per hectare improved only by factor 1.25 over the period from 1993 to 2011. **Figure 5.11** provides the overall picture for production, imports, exports, and domestic consumption (the latter equals production plus imports minus exports) of crops. Production and imports are dominating, while exports are comparably small. Crops for domestic consumption grew by factor 2.6 (including food waste).

²⁰ Chapter 5.3 was written by by Willi Haas and Hailemariam Birke Andarge

²¹ The Food Security Risk Index 2010, released by risk analysis and rating firm Maplecroft, evaluates the risks to the supply of basic food staples for 163 countries. It uses 12 criteria developed in collaboration with the World Food Programme to calculate the ranking, including: the nutritional and health status of populations, cereal production and imports, GDP per capita, natural disasters, conflict, and the effectiveness of government.



Therefore, crops available for human consumption were actually lower throughout the whole period.

In the period from 1993 to 2010, for which detailed crop data are available, population increased from 53 to 83 million people (a factor 1.6 increase, **Figure 5.10**). Consequently, the amount of food available per capita from crops increased from 260 to 470 kg/cap (a factor 1.8 increase, **Figure 5.12**).

The main crops produced in Ethiopia were teff²², a type of cereal, maize, and arracacha, arrowroot, and chufa (types of roots and tubers), sorghum, and wheat, which together make up 63% of the total crop production in 2012 (see **Figure 5.13**). All of these crops were entirely consumed domestically, except for maize, which was also exported, albeit at a very low level. Of the 6 Mt of maize produced in 2011, only 0.06 t (1%) were exported. In contrast to maize, sesame and coffee are more strongly produced for export, with export shares of nearly 100% and 40%, respectively in the same year. Dry beans are produced for both domestic consumption and exports, with an average export share of 20% during the period 2001 to 2011. Sesame, coffee, and dry beans dominate crop exports (56% of crop exports in 2011, see **Figure 5.14**). While crop exports are relatively small compared to overall crop production, they are increasing significantly. Over the period 1993 to 2011, overall crop exports increased by factor 9. Only the export of coffee as a long-standing export crop grew more slowly (factor 2). Sesame played a minor role in Ethiopian exports in 2001, while it constituted almost 30% of the entire crop exports in 2011.

²² Teff is an annual grass native to the Ethiopian and Eritrean Highlands, similar in cooking to millet.



Figure 5.10

Population in Ethiopia in millions from 1950 to 2010. The arrow indicates a population growth by factor 1.6 in the period from 1993 to 2010.

Source: UNPD, 2012

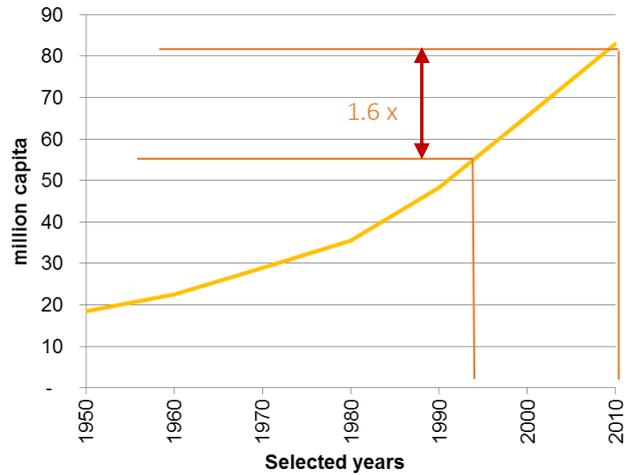


Figure 5.11

Crop production, imports, exports and consumption for the period 1993-2011 in Gt per year.

Source: FAOSTAT, 2014

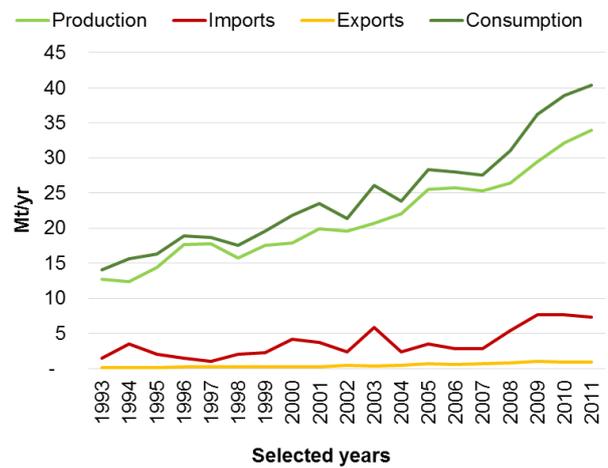
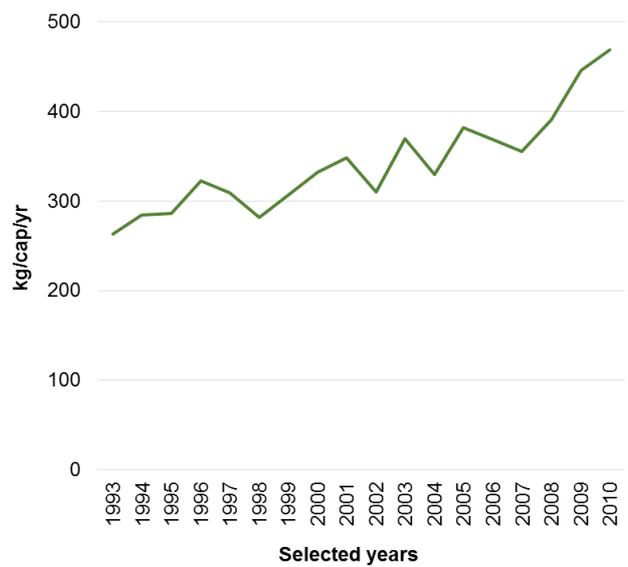


Figure 5.12

Per capita crop consumption in kg for the period 1993-2010. This still includes food waste.

Source: FAOSTAT, 2014





A detailed analysis of crop production by Lavers (2012a) reveals that the vast majority of most crops is used for domestic production. The little surplus in the main staples maize, sorghum, wheat, teff, enset (belonging to the banana family and also called false banana), and pulses produced in rural areas and not needed for consumption there feeds the urban population. A larger share of marketed teff indicates increasing demand due to the changing diets of the urban population (Lavers, 2012a).

Fig. 5.13
Production of top five primary crops (top in 2012) in Mt for the period 1993 to 2012.

Source: FAOSTAT, 2014

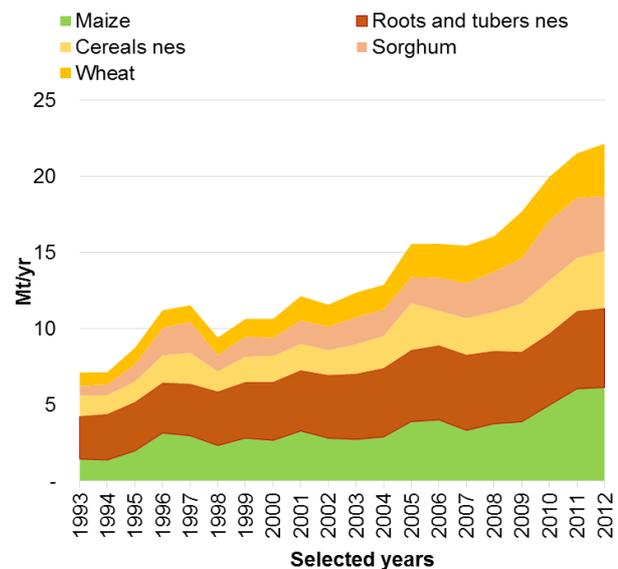
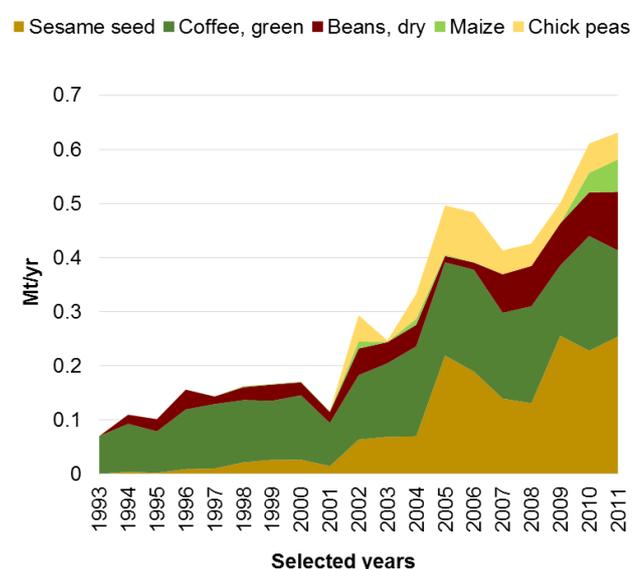


Fig. 5.14
Production of top five export crops (top in 2012) in Mt for the period 1993 to 2012.

Source: FAOSTAT, 2014



5.3.2 Agricultural development-led industrialisation policy to secure food supply

Due to political dynamics, exports played a minor role in Ethiopian politics until recently. The current Ethiopian regime, having gained power in 1991, was organized along Maoist principles, prioritising peasant farming in order to gain their support (for more detailed political history see Lavers, 2012a). The governing



party was re-established as the Ethiopian Peoples' Revolutionary Democratic Front (ERPFD) after they have seized power on the national level, which aimed at securing international legitimacy and development assistance by claiming to have switched to a market-based development strategy while still maintaining tight control over the economy.

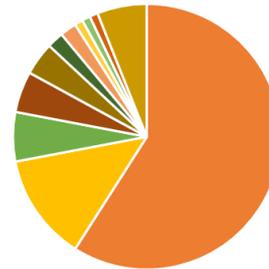
Since a large share of the population primarily depends on agriculture, according to the government, development requires rapid agricultural growth (MoFED, 2003). Since 1993 the government has deployed a strategy of 'agricultural development-led industrialisation' (ADLI), which assesses that Ethiopian agriculture is labour-rich and capital-poor. Agricultural development measures should implement labour-intensive, and non-mechanised measures, while simultaneously, government policies support technologies such as irrigation, use of fertilisers and of improved seed varieties, which increase yields but do not replace labour (MoFED, 2003). It is intended that increased agricultural productivity should lead to national food security, equitable growth, and smallholder security (MoFED, 2003).

The land policy is based on state ownership of land with a guarantee of usufruct rights for smallholders, which is not a property right for land, but the right to use and sell the harvest. The government claims that the usufruct right protects peasants from displacement. However, it can also be seen as a populist policy, which appeals to the party's political base. By placing restrictions on land transactions and land transfers, the land policy limits the emergence of large landholders, and consequently creates landless peasant. The government sees the latter as *source of economic, political and social instabilities* (MoFED 2002, 56; Rahmato, 2009; Lavers, 2012b). Consequently, there was virtually no capitalist agriculture in Ethiopia until recently, and smallholder production accounted for 95% of agricultural output (CSA, 2009). The wealth of households varies by their access to land, labour, oxen, and irrigation. Farmers rely primarily on the labour provided by their own household, resulting in just minimal class differentiation in rural areas (Rahmato, 2003; Lavers, 2012b).

ADLI has yet not achieved food security and many rural areas still rely on food aid. In 2011, the major donor was the US, followed by the United Nations (WFP, 2012; also see **Figure 5.15**). In reaction to domestic shortages, a directive issued in 2006 banned most cereal exports (MoTI, 2008). This measure was intended to hinder profits made from the export of crops which were urgently needed for domestic food supply.

Fig. 5.15
Donors of food aid for Ethiopia
in percent in 2011.

Source: WFP 2012



The living conditions of more than 7 million Ethiopians are classified as 'chronically food insecure' and these people receive regular support from the cash- and food-for-work Productive Safety Net Programme (PSNP) (MoARD, 2009). The program was established by the Ethiopian government, the World Food Programme, and development partners in 2005 and is aimed at enabling the rural poor facing chronic food insecurity to resist shocks, create assets, and become food self-sufficient.

PSNP provides multi-annual predictable transfers, as food, cash or a combination of both, to help people facing chronic food insecurity survive food deficit periods and avoid depleting their productive assets while attempting to meet their basic food requirements. In past years, several million more people required emergency assistance due to weather-related or other shocks. In 2011, partly due to insufficient rains across East Africa, 4.5 million people needed urgent aid in Ethiopia (FAO, 2011). Since 2000, food aid was mainly received as wheat, corresponding to roughly 50% of domestic wheat production (WFP, 2014). Overall crop production was about 37 Mt compared to 0.8 Mt food aid in 2011 (see **Figure 5.16**).

Fig. 5.16
Food aid and domestic wheat
production in Ethiopia in Mt from
1993 to 2012.

Source: WFP, 2014





While ADLI is focused on improving food security through domestic production, exports are required to generate revenue to allow for food imports, but also for imports of capital goods required for industrialisation (MoFED, 2002).

5.3.3 Policy shifts towards (foreign) large scale investments

There is growing evidence that ADLI has not provided the envisaged successes in terms of food security, while at the same time the population is growing strongly and Ethiopia is increasingly dependent on food aid. Policies focusing on domestic production alone seemed not to suffice. Additionally, many donors like the World Bank exert increasing pressure in favour of agricultural commercialisation (Teshome, 2006).

While the extent of lobbying for market and land access of foreign investors remains unclear, changes in policies on agricultural development have been implemented. Currently, the largest investors in Ethiopia are companies from India, Germany, Israel, and Saudi Arabia.

ADLI, despite claiming to promote mainly smallholder-based agriculture, has also continuously allowed for large-scale agricultural development with the proviso that it not threatens the interests of smallholders (MoFED, 2002). However, only in recent years has there been a fundamental change, with large-scale agriculture being used as a new strategy. According to Lavers (2012b), this might possibly be due to two causes: First, stagnation in the smallholder sector and second, international drivers of the land grab (Friis and Reenberg, 2010).

In seeking commercialisation of agriculture and foreign investment, the Ethiopian government developed a spatially differentiated dual approach: First, smallholders in the highlands were supported in improving cereal productivity and specialising in 'niches' of high-value export commodities and second, foreign and domestic investment for *supporting the development of large-scale commercial agriculture where it is feasible* (MoFED, 2005, 47) was attracted. The government claims that these two approaches are entirely separate, since 'unused' land that smallholders could not develop due to a lack of resources is provided for these investments to expand production, while avoiding displacement.

Government officials expect foreign investment in agriculture to increase production of biomass for food and industrial uses (e.g., cotton). This in turn should improve food security and promote industrialisation (Lavers, 2012b). Furthermore, foreign investment should boost production of export crops in order to earn foreign exchange (MoFED, 2005; 2010), strengthening the role of trade in the Ethiopian development strategy.

5.3.4 Agricultural investments in recent years

The government aims to implement its agricultural development strategies with objectives including increasing production of export crops and food, expanding industrial processing and creating employment as well as raising productivity in the smallholder sector. Agricultural investments should contribute to these objectives and are closely monitored by the government. Investors must obtain a general investment licence from Ethiopian government institutions before they are



allowed to submit a project proposal to apply for land. The government selects those proposals which are in line with its priorities and grants leases to investors for fixed periods of time, in practice between 15 and 50 years. Since land remains state property, the government can end the lease if investors fail to follow agreed plans. Investors exporting their production especially benefit from exemptions from corporation and export tax obligations. Furthermore, the Development Bank of Ethiopia (DBE) lends money at low interest rates with little guarantees required by the investors (Lavers, 2012b).

Based on observed practice, Lavers distinguishes two types of projects. There are so called pre-implementation projects, which, according to the Ethiopian Investment Agency (EIA), are projects where the investor has been granted an investment licence by the relevant authority but land has not yet been allocated. In contrast, active projects are those in which land has been allocated to the investor and implementation or operation have begun.

In 2011, almost 5 million hectares were assigned to pre-implementation projects and 0.7 million hectares were active projects (compared to about 9 million hectares of harvested area (FAOSTAT, 2014)). Export crops cover 32% of area amongst the pre-implementation projects and 20% of area amongst active projects which correspond to 49% of the number of active projects. **Table 5.1** distinguishes between area in ha and the number of projects. Compared with other crops (e.g., agrofuel crops), they are comparably small in area size. However, small in this context still means having an average size of 900 ha. The export-oriented ventures are expected to earn foreign exchange and to improve wages (Sklair, 1994). Agrofuel crops (primarily castor and jatropha) constitute 15% of area amongst the pre-implementation projects and 39% of area amongst active projects. Thus, agrofuel crops are the crops with the largest area. The active agrofuel projects are in numbers just 2% or 7 projects, indicating an area size of 36,000 ha per average project. While domestic processing of agrofuels in Ethiopia could substitute for imported fuel, there are no facilities to process agrofuels so far. These crops are currently exported, with China being the most important destination (Lavers, 2012b).

Table 5.1

The role of foreign investment crops. Percentage is given as the share of the total size of the colonized areas. The distinction between 'export crops' and 'biofuel crops' refers to their likely role in the economy

Sources: Lavers, 2012b; based on EIA and MoARD, 2011

	Pre-Implementation (ha)	%age	Active (ha)	%age	Active (no. of projects)	%age
Export crops	1.577.161	32%	129.497	20%	144	49%
Coffee	29.680	1%	3.601	1%	6	2%
Horti/floriculture	278.019	6%	3.274	0%	99	33%
Oil crops	502.632	10%	73.687	11%	11	4%
Wheat	502.535	10%	0	0%	0	0%
Other	264.295	5%	48.935	7%	28	9%
Biofuel crops	745.410	15%	255.101	39%	7	2%
Industrial inputs	504.294	10%	120.314	18%	23	8%
Peasant foods	522.267	10%	91.565	14%	22	7%
Wage foods	905.251	18%	46.235	7%	75	25%
Miscellaneous	725.386	15%	13.194	2%	25	8%
Total	4.979.769	100%	655.906	100%	296	100%



7% of the active projects contribute to 'peasant food' availability, producing cereals and pulses. A major investor is Karuturi, an Indian investor which has stated that it intends to sell the crops on local markets in Ethiopia, with the remainder destined for neighbouring African countries. A few other foreign investors that produce rice and wheat for export, according to their corporate social responsibility (CSR) strategy, have volunteered to sell a part of their produce domestically (Empora, 2009; Capital Newspaper, 2010). However, these projects can make a small contribution at best to rural food security in Ethiopia.

Mainly livestock projects producing meat are listed under 'wage foods' in **Table 5.1**. Specific details for these projects remain rather unclear. Some projects are intended to contribute to industrialisation via integrating local food processing. A few exemplary projects contribute directly to local processing, with rice and sesame dryers planned by investors to cater to expanded production (Alemu, 2010). A Chinese sugarcane plantation (size 25,000 hectare) in Gambella (MoARD, 2011) promises the development of local processing facilities since, in order to prevent fermentation, sugarcane requires processing shortly after being cut. With cotton, as the major crop for industrial use, the case is different, since it can be exported easily, allowing for processing outside Ethiopia. It therefore remains unclear to what extent cotton projects contribute to the industrialisation in Ethiopia (Lavers, 2012b).

5.3.5 Conflicts

There are several sources that provide evidence on environmental conflicts resulting from land acquisition projects as discussed above.

The Oakland land investment country report on Ethiopia

The most comprehensive source is a report issued in 2011 by the California-based Oakland Institute (Oakland Institute, 2014). The report is based on interviews with impacted communities, government officials, investors, civil society, and others and analyses the situation in order to provide an understanding of the impacts of land investments on the land and its people.

The general findings regarding the process of awarding millions of hectares of land to foreign and national agricultural investors show significant environmental conflicts and questionable benefits. At least 3,619,509 ha of land have been transferred to investors, although the actual figure may be higher. Commercial investment is expected to increase rates of food insecurity in the vicinity of land investments. While there are no mechanisms in place to improve local food security, there are numerous incentives to ensure that food production is exported out of the country, providing foreign exchange at the expense of local food supplies. Despite the Ethiopian government's objective of technology transfer via land investments, no mechanism has been established to secure such a transfer.

The report states that large discrepancies exist between publicly stated positions, laws, policies, and procedures on the one hand and what is actually happening on the other hand. While the Ethiopian government claims to have conducted consultations for all land deals and states that only 'unused' land has been



provided and that no farmers were displaced, the report's investigations did not find a single incidence of community consultation. Furthermore, virtually every investment site the research team visited involved the loss of some local farmland and every investment area exhibited a variety of land uses and socio-cultural/ecological values associated with it prior to land investment.

The research team encountered a great lack of local knowledge about these land investments, with local communities only becoming aware of such changes once bulldozers arrive to clear the land. Local people were displaced from their farmlands and communal areas in almost every lease area visited by the research team. The majority of these investments occurred in the lowland areas. Since the government pays little attention to patterns of shifting cultivation, pastoralism, or communally used areas, they claim that the respective lands are 'unused'. People who were displaced are forced to find farmland elsewhere, which may in turn lead to tensions with other farmers over access to land and resources. Due to a lack of pre-project assessments, potential benefits are not generated. The report states that forests are being cleared, critical wildlife habitat lost, and livelihoods destroyed.

The EJOLT database

Another source is EJOLT's own database on environmental conflicts. In September 2014, this contained 1 case related to a hydro power dam and 5 cases related to biomass for Ethiopia. The latter cases are listed in **Table 5.2** and are marked in **Figure 5.17**. Most of the commodities produced in these cases are typical crops for exports and are recorded for the Gambella Region and for the Lower Omo Valley.

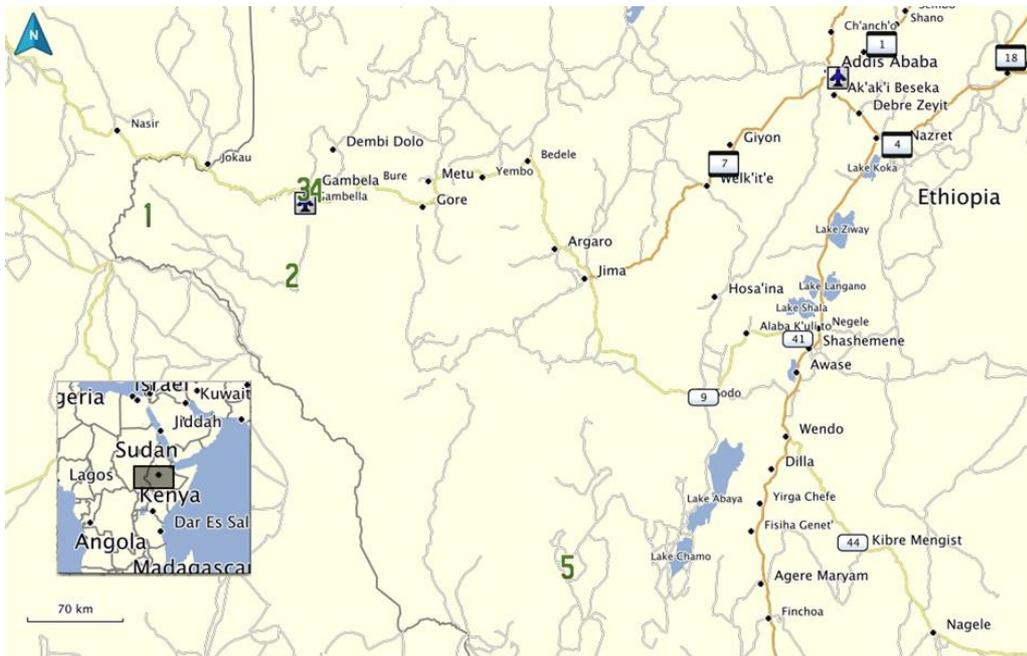


Figure 5.17

Conflicts recorded in the EJOLT data base

Source: Ejalatlas.org, accessed 09.2014

- 1 Ruchi Agri soybean operation in Gambella
- 2 Saudi Star agriculture and irrigation project in Gambella
- 3 Karuturi Global plants sugar and other crops in Gambella
- 4 Gambella agri-export land dispossessions
- 5 Lower Omo Valley irrigated agriculture development

Table 5.2

Basic information on cases extracted from the EJOLT database and edited.

Source: ejatlas.org, accessed 09.2014

Name	Commodities	Description
1 Ruchi Agri soybean operation in Gambella	Soybeans processing facilities	Ruchi Group, the leading cooking oil manufacturer in India, signed a contract for a 25-year lease on 25,000 ha for the production of soybeans in 2010. The locals and the government disagree as to the status of occupation of the land. The government claims the land to be unoccupied, 'virgin lands', while multiple accounts of 'villagization' from this region contradicts this claim.
2 Saudi Star agriculture and irrigation project in Gambella	Rice Teff oilseed sunflowers water live animals sugar corn/maize	Saudi Star PLC obtained a 60-year concession on 10,000 ha in 2008, while the total area they leased is 140,000 ha. In 2012 they developed rice production supported by an irrigation project (funded by the government of Ethiopia). In January 2012, Human Rights Watch reported that local populations were forcibly displaced for the rice project. Conflicts emerged resulting in 5 dead and 11 wounded. Retaliation attacks were reported. Federal police now guard the area. The project is also infringes on Gambella National Park boundaries.
3 Karuturi Global plants sugar and other crops in Gambella	Corn/maize palm oil sugar land rice	The Indian Karuturi Global Ltd signed an agreement in November 2010 for a long-term lease on 11,000 ha in the Oromia Region and a 50-year lease on 100,000 ha in the Gambella Region. By 2012 only 12,000 ha were planted with rice and corn, prompting the government to renegotiate the lease. Human Rights Watch, the Anywaa Survival Organisation, and other opposition movements have accused the Ethiopian government of forcing farmers from the area leased to Karuturi (and other international companies).
4 Gambella agri-export land dispossessions	Cut flowers land sugar palm oil rice	Another Karuturi Global land lease deprives about 5,000 Ilea indigenous people from the lands they use for farming along the Openo River. The Ilea people were not consulted about the deal. Rents for this area were reported to be as low as 15-20 ETB per ha (USD1-1.25). Another major company involved in the Gambella region is Saudi Star Agricultural Development Company. Legal analyses of the land lease contracts raises concerns about lease rates per hectare, infrastructure development, water use provisions and environmental responsibility.
5 Lower Omo Valley irrigated agriculture development	Sugar	Massive agricultural developments in the form of state-run sugar plantations and commercially leased land for the Lower Omo Valley are planned by the government. These plans are linked to the controversial Gibe III dam upstream of the Lower Omo Valley for large-scale irrigation agriculture. The sugar plantations are linked to the country's plans to increase its international market share of the commodity. However, the Lower Omo Valley is home to an estimated 200,000 agro-pastoralists, who would be negatively affected in terms of their access to water for growing crops and their ability to exercise their way of life. Reports based on interviews with inhabitants of the region indicate that forced evictions, denial of access to subsistence land, beatings, killings, rapes, imprisonment, intimidation, political coercion, and the denial of government assistance are all being used as tools of forced resettlement (Oakland Institute, 2013). International donors have been accused of supporting the programs connected with the resettlement sites. The US Agency for International Development (USAID) and the UK's Department for International Development (DFID) conducted a joint field investigation, but did not find evidence to support the claims of human right violations. The field visit performed by the Oakland Institute (2013) thereafter, in stark contrast, provided testimony from the affected communities showing that egregious human rights violations have taken place. Ethiopia's policy of 'villagization' in other parts of the country has been widely criticized for a lack of consultation with local communities, for intimidation and force. The Lower Omo Valley seems to be no exception in this, as the same approach is being adopted.



Field research on acquisition in Bako, Oromia and Gambella regions

The research paper by Yassin (2010), as part of his Master Thesis at the International Institute of Social Studies, Erasmus University of Rotterdam covers large scale transnational land acquisition in Ethiopia with specific reference to two agrofuel and food crop production corporation in Bako²³ and in the Oromia and Gambella²⁴ regions. Primary and secondary data were collected from local communities, corporations, government offices, civil society organization, and NGOs, with access to government documents and land deal contracts being the major obstacle.

According to this account, local farmers in Bako reported *we are victims of time*. The land which local farmers had used for grazing and additional farming was no longer accessible to them since land was fenced and grazing lands and river waters were controlled by the corporations. The small area of grazing land left was insufficient for the local farmers' cattle. Consequently, farmers were forced to sell their cattle, resulting in a reduction of cattle prices in a nearby market by 40% (Tamrat, 2009). Complaints to the corporation led to promises of cattle feed to compensate for the lost grazing areas. This scheme was not implemented and the local community is now forced to travel 8 km away in search of pasture for grazing and water as the road providing a shortcut to the nearest river is blocked.

The analysis indicates that investors receive arable lands and displace local people. Despite constitutional provisions which grant compensation in case of displacement, no compensation has yet been provided in either the Bako or Gambella areas where the local population's livelihood is based on farming and cattle herding. Local mango fruit production on the land has been cleared without compensation. Corporations cleared the land and burned trees and shrubs in order to increase the fertility of the soil.

5.3.6 Concluding remarks

In Ethiopia, a country with a high level of food insecurity, the government has provided substantial amounts of land for foreign and national investors (14% of agricultural land are in the pre-implementation phase and 2% are actively used in 2011). Most of the produce from this land is exported (e.g., coffee, floriculture, oil crops, and agrofuel crops) and thus does not contribute to an improvement of the domestic food situation. Instead of beneficial effects, adverse ones have been reported. People have been forced from the lands they were using, depriving them of access to environmental resources that are crucial to their livelihood.

²³ Karuturi Global Plc is an investor in Bako region (the same investor as in case 3 in Table 5.2)

²⁴ Saudi Star PLC is an investor in Gambella (the same investor as in case 2 in Table 5.2)



6

Conclusions

Hazards of the corporate food regime and the importance of smallholder farming for global food security and food sovereignty²⁵

The concept of food regimes can be used to analyse developments in the global socio-economic system through the lenses of food production, distribution, and consumption. The first food regime was the phase during which imports from the colonies to Europe were the main trade flows of agricultural produce. The second food regime began after WW II, when global powers striving for hegemony sought to obtain access to new markets for surplus agricultural production and simultaneously increase their influence in the peripheries. Some of the present-day import dependency for agricultural commodities of countries around the world stems from this period. The third food regime, in general observed to have emerged since the late 1980s, exhibits several patterns that were already present in the second regime and also establishes new forms of dependency and interrelations in the global (agricultural) system.

While agricultural trade mainly flowed from the global North to the South during the second food regime, the global South increasingly produced food, feed, fibres, and fuels for the global market, especially for the demands of the global North, during the third regime. In some countries, the export of agricultural produce contributed substantially to economic growth. Brazil, for example, became a major global supplier of soy, sugar cane, meat, and several fruits in following this development pathway (GRAIN et al., 2014). Other Latin American countries have followed this same pathway, such as Argentina, Paraguay, or Uruguay, mainly based on biomass exports, while other economies extract and export non-

A kind of reverse agrarian reform is taking place in many countries (GRAIN, 2014).

²⁵ With contributions from GRAIN



While agricultural trade mainly flowed from the global North to the South during the second food regime, the global South now produces food, feed, fibres, and fuels for the global market, especially for the demand of the global North.

renewable resources such as oil, gas, and mineral resources. Where progressive governments are in power, the export revenues have partly been used to finance social programs for the poorest inhabitants (Yates and Bakker, 2013).

However, several concerns have been raised with regard to this export-based development by impacted populations, scholars, EJOs, and the media. The current global restructuring of agriculture is often referred to as accumulation by dispossession (Dörre, 2011; Harvey, 2005; Zeller, 2007). This term describes the continuous process of appropriation (of land, in this case) driven by the need to accumulate capital under the current economic system. Increased opportunities to make land-based profits are partly related to changing diets and demand for biomass in many parts of the world: As more animal products are consumed, the demand for animal feed rises. Overall, an agri-food system in which a higher share of calories consumed by humans stems from animal products has a higher total calorie throughput. Cereals and oil crops which could have been directly consumed by humans, are consumed indirectly in animal products with according food energy losses along the production chain (Erb et al., 2012b). Next to the use of biomass for food, other uses have also contributed to the expansion of production frontiers. Fibre crops, wood and other forestry products, as well as oil-bearing crops are (increasingly) grown for non-food purposes such as use in textile production (fibre crops), paper and paperboard production (wood, pulp), and in production of oils used in cosmetics, lubricants or agrofuels (oil-bearing crops). Industrial tree plantations of, for example, eucalyptus, acacia or oil palm are expanding rapidly, often linked to dispossession of smallholders and peasant communities (see EJOLT report 3 on industrial tree plantations (Overbeek et al., 2012)). Direct competition may emerge between food uses (e.g., plant-based and animal-based diets) and between food and non-food uses. This competition may direct when one plot of land can only be used to grow one particular crop or indirect when new production patterns impact the price of certain commodities as was the case with the food price peaks of 2008.

Export-oriented development seeks to obtain revenues with which resources not locally available can be purchased (via imports). People living in urban areas depend almost entirely on markets in order to meet their nutritional needs so that the existence of urban and rural areas necessitates the existence of a food market. Simultaneously, market penetration to rural areas changes the ways in which non-urban populations satisfy their dietary needs as well. The majority of the population in the global South depends on food that is produced by smallholders or in subsistence farming. This mode of agricultural production requires land that is often described as – compared to yields reached in industrial agriculture – ‘underused’. Whether they live in urban or rural areas, people that rely on market food require functioning markets and distribution systems, and of course the financial means to access these markets.

Next to potential obstacles to food security in market-based food systems, the production side of food security is also severely threatened by pressures faced by smallholders with mainly low-input low-output agricultural systems. These



pressures and their impacts are illustrated by the following developments (GRAIN, 2014):

1. The vast majority of farms in the world today are small and getting smaller, while at the same time more and more land concentrates in the hands of less people. What is happening in many countries right now is a kind of reverse agrarian reform, whether it's through corporate land grabbing in Africa, the recent agribusiness-driven coup d'état in Paraguay, the massive expansion of soybean plantations in Latin America, the opening up of Burma to foreign investors, or the extension of the European Union and its agricultural model eastward. In all of these processes, control over land is being usurped from small producers and their families, with elites and corporate powers pushing people onto smaller and smaller land holdings, or off the land entirely into camps or cities.
2. Small farms (less than 2 ha in size) currently occupy only one quarter of the world's farmland.
3. In many places, the number of farms and of farmers are declining while large agrohholdings are increasing in area. Monoculture plantations are rapidly growing. In the last 50 years, 140 Mha – roughly the same area as all the farmland in the European Union - have been taken over for soybean, oil palm, rapeseed, and sugar cane alone since 1960.
4. In spite of the decline in small farms, they continue to be the major food producers in the world. Peasant agriculture prioritises food production for local and national markets as well as for farmers' own families – not commodities or export crops.
5. Small farms are are not in general less productive than big farms. Industrial farms have enormous power, clout and resources, but small farms may even outperform big farms in terms of productivity (GRAIN, 2014).
6. The majority of small farmers are women. In many countries, women do not have the same rights to own land as men do, despite the fact that they mainly work this land (e.g., Nwakeze and Schaffartzik, 2014).

This pressure on small-scale farming is both a result of and contributes to the global restructuring of agricultural production which leads to an increased concentration of agricultural lands, increasing homogeneity in global food supplies, and growing interdependence among countries in their food supply (Khoury et al., 2014). GRAIN (2014) has referred to these processes as *the invasion of megafarms*. The expansion of industrial commodity crop farms is perhaps the single most important driver threatening the future of small-scale farming. The demands of food and energy industries are shifting farmland and water away from direct local food production to the production of commodities for industrial processing. The graph below (**Figure 14**) shows how just four crops – soybean, oil palm, rapeseed, and sugar cane – have quadrupled in terms of the

On this topic, the only real policy recommendation that I see is that the expansion of the commodity crops should be stopped and reversed, and land should be reverted to food production in the hand of small farmers. (Henk Hobbellink, personal communication)



land they occupy over the past five decades. All are grown mainly on big industrial farms.

Since the 1960s, 140 Mha of land have been taken over by monocultures. This growth is clearly accelerating: almost 60% of this land use change occurred during the last two decades. Not only these crops but also other monocultures grew at very strong rates. The FAO calculates that in developing countries alone, monoculture tree plantations grew by over 60%, from 95 to 154 Mha, between 1990 and 2010. Many of these new plantations are encroaching on natural forests, but they are also increasingly taking over farmland.

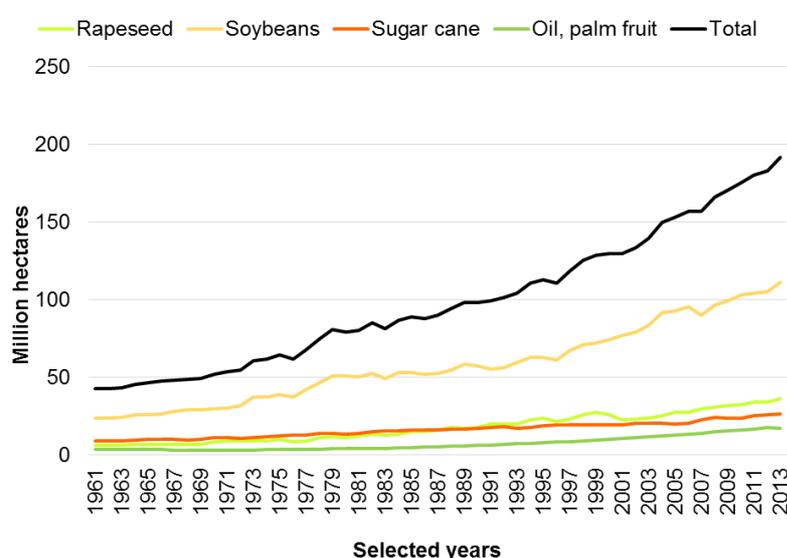


Fig. 14

The global encroachment of industrial crops (primary y axis) and the evolution of global cereal production area (secondary y axis). Data given in Mha of harvested area

Data Source: FAOSTAT, 2014

Without significant changes in government policies, these commodity monocultures are set to expand further. According to the FAO, between now and 2050, the world's soybean cultivation area will increase by one third to some 125 Mha, the sugar cane area by 28% to 27 Mha, and the rapeseed area by 16% to 36 Mha (Alexandratos and Bruinsma, 2012). As for oil palm, there are currently 15 Mha of palm oil are used to produce edible oils. Depending on dietary patterns and yields, an additional 19-29 Mha of palm oil area has to come into production by 2050 (Corley, 2008). Much of this expansion will occur in Africa, Asia, and Latin America. Soybean and sugar cane are currently mostly produced in Latin America, and oil palm in Asia, but these crops are also expanding in Africa and Latin America as part of the global wave of land grabbing.

As biomass production for (export) markets expands, more and more countries find themselves with development pathways based on biomass extraction for export. The case studies on Indonesia, Paraguay, and Ethiopia in this report are examples for economies basing their economic development mainly on the extraction and export of natural resources (the first two cases), or economies where many signs indicate that government policies are leading to such economic development (Ethiopia). The main agricultural exports from Indonesia and Paraguay are palm oil for the first and soy and derived products in the latter case.



Both products stem from so-called flex crops that have a variety of uses, e.g., direct human consumption, high protein animal fodder, or for the production of agrofuels. The flexibility of uses keeps these crops economically viable and prices less dependent upon global demand for one category of use. Transnational corporations and investment companies are directing their investment capital towards the acquisition of lands for the production of such flex crops. In the case of Indonesian palm oil, a large share is now directed to feed monogastric livestock in Asia, as well as to be consumed as vegetable oil, mostly in China and India. These new competitors for Indonesian palm oil trigger shifts in European trade patterns, traditionally a major consumer of Indonesian palm oil that now has to seek for other sources for its crop imports. Overall, Europe and East Asia are now dependent on biomass imports, which is one explaining factor for their involvement in global investments in large-scale land deals (The Land Matrix Global Observatory, 2015).

One major target country for large-scale land deals is Ethiopia (Horne and Mousseau, 2011). Ethiopia has been known to the outside world as a country of famine, food shortages, endemic hunger, and chronic dependency on foreign aid. However, the case study on Ethiopia lists 296 active projects focused on the production of agricultural export commodities currently covering 0.7 Mha and intended for expansion to nearly 5 Mha. Government officials have clearly announced that Ethiopia strives to become a major agricultural exporter in the next decades (**Chapter 5.3**). This development is intended to bring foreign revenues to Ethiopia, which is currently one of the largest recipients of food aid globally.

Whom this export-driven development benefits, depends on how the entailed income is distributed within the country and how the environmental and social impacts of this development pathway are regulated or absorbed. Various critical voices have supplied evidence that adverse environmental and social impacts of large-scale land acquisitions can already be observed, with few or no alternatives available to the local population (Horne and Mousseau, 2011). As local subsistence systems are displaced, important knowledge of smallholders, pastoralists, indigenous people, and traditional communities for agricultural production within the limits of local sustainability is lost. The integration of all population segments into market-based agri-food systems is often not successful and results in declining local food security and sovereignty (Pokorny et al., 2013).

This report has identified changes in global patterns of biomass production and trade which have accompanied the development of the third food regime with its restructuring of global agriculture. The specific form of a country's integration into the global food market has been found to be potentially decisive in issues of food security and sovereignty. Food import dependency signifies that large shares of the population's food demand must be met via markets with possibly detrimental effects for those who do not have unrestricted access to these markets. Import dependency for staple foods is often linked to a focus on the production of (flex) crops for export within the country – a production which displaces subsistence agriculture and causes larger segments of the population to depend on access to



food markets. The case studies on Indonesia, Paraguay, and Ethiopia showed very clearly that an export orientation of agriculture often fails to deliver the promised or envisioned societal benefits. The numerous socio-environmental conflicts that were collected during the EJOLT project provide evidence that a continuation of the third food regime bears high conflict potential.



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